LIBRARY
6
#2206
cop. 2
MAY 26 1942
U. S. Department of Agriculture

FARMERS DIGEST

JUNE, 1942

Volume 6
Number 2

25c a Copy
$2.00 a Year

... Of 13 Ways of Making Hay ..... *Farm Science Reporter* 1
How to Make the Mower Work Better ..... *American Agriculturist* 5
A Wagon Worth Millions ..... *Nation's Business* 8
Farmer's Chemist ..... *New Jersey Agriculture* 12
Legume Inoculation for Nitrogen and Protein .... *Rural New-Yorker* 13
How to Calculate Parity Prices ..... *Southern Planter* 17
Farmers Build a Market ..... *Extension Service Review* 20
Artificial Udder Growth ..... *Jersey Bulletin* 22
How Much Roughage for Sheep? ..... *Kansas Farmer* 30
Plant Analyses ..... *Pacific Rural Press* 32
Which Forage Crops? ..... *New England Homestead* 36
Vitamin C for Sterility ..... *Holstein-Friesian World* 39
Device Saves Baling Wire ..... *Agricultural News Service* 43
Better Quality Eggs ..... *Everybody's Poultry Magazine* 44
Fence Row Facts ..... *Soil Conservation* 47
Planning the Use of Pasture ..... *Eastern States Cooperator* 49
Dried Eggs ..... *Poultry Tribune* 52
Fertilizing Corn ..... *Missouri Ruralist* 55
Good Tractor Care ..... *Pennsylvania Farmer* 57
Frequency of Milking and Production ... *Guernsey Breeders' Journal* 59
Land Settlement ..... *Reclamation Era* 60
Power of the Horse ..... *Cattleman* 64
More Flax ..... *Successful Farming* 69
Why Creep Feed Calves? ..... *Shorthorn World* 73
New Crop for the South ..... *Texas Farming and Citriculture* 76
Production Testing for Hogs ..... *American Hampshire Herdsman* 79
Sudan Grass 82
Soil Acidity for Farm Crops ..... *The Ohio Farmer* 85
For the Farmer's Library 86

The Farmer's Digest

EDITORIAL STAFF:

Editor—L. Bush-Brown Assistant Editor—C. Leavitt Dyer

Business Manager—A. E. Heick

Associate Editors—
John A. Andrew, Jr., James Bush-Brown, Ruth Patrick

ADVISORY EDITORIAL STAFF:

William A. Albrecht
Chairman, Department of Soils
University of Missouri

John D. Beck
Professor of Veterinary Medicine
University of Pennsylvania

Hugh H. Bennett
Chief, U. S. Soil Conservation Service

D. B. Johnstone-Wallace
Assistant Professor, Department of Agronomy
Cornell University

H. J. Reed
Dean of the College of Agriculture
Director of the Experiment Station
Purdue University

Howard B. Sprague
New Jersey Agricultural Experiment Station

M. L. Wilson
Director of Extension Work
United States Department of Agriculture

The Farmer's Digest

Published Monthly at Ambler, Pennsylvania
by the Farmer's Digest, Inc.

25c a Copy *1 Year $2.00*

2 Years $3.50 *3 Years $5.00*

Foreign and Canadian Subscripions $2.50 a Year

Entered as second-class matter at the Post Office at Ambler, Pa., May 5, 1937, under act of March 3, 1879

The Farmer's Digest

Volume 6 June, 1942 Number 2

. . . Of 13 Ways of Making Hay

Reprinted from Farm Science Reporter

H. D. Hughes and E. R. Henson

Iowa Experiment Station

THIS business of getting hay cut, cured and stored in the barn without losing the leaves and the green color—that's the problem which annually confronts some 200,000 Iowa farmers who have about 3 million acres of hay land from which they harvest around a 5-million ton crop.

It's a tough problem. To help us arrive at the most satisfactory method of making hay in Iowa, we seeded a field of alfalfa here at the Iowa Station back in 1926 for no other purpose than to study the methods of making hay.

In this search for the best method of making hay, we tried 13 different methods. With some of these methods in certain years, hay was cured and ready for the barn at the end of 17 curing-hours ("curing-hours" are those between 7 A.M. and 6 P.M.); other methods required 50 hours and with one method we tried it took 96 hours.

It was not because of the difference in maturity of the hay, the time of cutting or the weather, because it was hay of the same field, cut side by side at the same time for the different methods and with, of course, the same weather conditions. The loss in curing varied from as low as 1 percent to 13, 16 and 20 percent. And, of course, the part lost was leaves—the best part of the hay. The method of handling hay in the curing process does make a difference in the value of the hay that gets into the barn. And a difference in the cost of getting it there, too.

Swath-Windrow Best

It is almost self-evident that to cure hay quickest, it should be left in the swath. But hay produced in this way is of poor quality, both from the standpoint of color and loss from shattered leaves. In four series of comparisons we made on different dates, hay completely cured in the swath ranked lowest in color and

also lost the most leaves, except when hay was tedded. Leaf-loss then was excessive.

Hay which was allowed to wilt thoroughly in the swath and was then placed in the windrow ranked almost at the top in color value and showed a relatively small loss of leaves.

Hay is usually considered safe to put in the barn when the moisture content is down to 30 percent. The moisture content of alfalfa when cut usually ranges from 70 to 75 percent. When the plants are well wilted and the moisture content is down to about 60 percent the hay is said to be one-fourth cured. This seems to be the stage of curing at which the crop can best be put in the windrow to complete the curing process.

But how is a farmer to know when his hay is one-fourth cured? Our answer to that is: Hay can be considered one-fourth cured when the plants are well or completely wilted, thoroughly limp or soft. The plants will be in this same condition at one-half cured, except that a few leaves will have begun to stiffen and harden.

Our tests showed that if the hay is not allowed to become more than one-half cured in the swath and is placed in the windrow before the leaves have become sufficiently dry to shatter, the quality will be almost as good as when put in the windrow sooner, and curing can be completed in 3 or 4 hours less time.

When the hay is allowed to become more than one-half cured in the swath before it is placed in the windrow, the loss of leaves is likely to be excessive and the color inferior. This combination means relatively low feeding value in comparison with that possible by the use of better methods.

Some good hay enthusiasts have advised windrowing hay immediately following cutting. In our tests, hay handled in this way required from 2 to 5 hours longer to cure than when allowed to partially cure in the swath and then windrowed. Contrary to expectation, the color value of the hay was not any better when windrowed as soon as cut than when partially cured in the swath. The loss of leaves was slightly less, but this is not a very important factor because the loss of leaves was very low when the hay was not allowed to become more than one-half cured while still in the swath.

We obtained the very best quality of hay from the standpoint of color and low leaf-loss when the hay was placed in medium-sized cocks, either immediately after cutting or when not more than one-fourth swath-cured. Few Iowa farmers are interested in curing hay in the cock because of the excessive

amount of labor required and the length of time that the hay must remain in the field after cutting. Twenty-six curing-hours were required to complete the job when the hay was one-half swath-cured and then placed in medium-sized cocks; fifty-one when placed in small cocks immediately after cutting; and fifty-six when one-fourth cured then placed in medium cocks; and ninety-two hours when put in medium cocks immediately after cutting.

Turning Windrows

The effect of turning the windrow with the tail of the rake was determined in four series of experiments. Windrows were turned when the hay was one-fourth, one-half and three-fourths cured, respectively. In our experiments, turning the windrow was of no particular value in hastening the curing of the hay. Probably the only time when it is worth while to turn the windrow with the tail of the rake is when the hay has been wet with rain, or when the crop is very heavy and the windrows large.

Hay Tedder Out

A few years ago hay tedders were used on a good many farms, but now they are seldom found. This is as it should be. Tedding did not materially speed up the rate of curing in our studies. We found that tedding the hay, at almost any stage in the curing process, materially increased the loss of leaves, and loss of leaves seriously decreases the feeding value of hay.

With a very heavy crop of grass, such as timothy or brome grass, it is possible that curing can be hastened by tedding and without any serious loss of leaves. But this does not seem to be true with such crops as alfalfa or clover.

When to Cut

Having observed that plants are partially wilted in the field in the afternoon, some folks have been certain that afternoon cutting is advisable because a part of the excess moisture has already been lost. We wanted to know how much less moisture there was in the afternoon, so we determined the moisture content of alfalfa in the field hourly from 8 A.M. to 8 P.M. on certain days in July and August. The maximum difference was found to be not more than 4 percent, and generally 2 to 2½ percent. Because plants may give up from 10 to 15 percent of moisture in a 6-hour period after cutting, it is evident that when weather conditions are favorable nothing is to be gained by postponing cutting until mid-afternoon. The hay will be ready for the barn in the shortest time if cut relatively early in the day.

The results obtained at the Iowa Station agree with those obtained by other workers—they

show that the moisture of the stem is not lost through the leaves; the stem dries as quickly with the leaves severed as when they are left on the plant. It is well to shade the leaves as much as possible, as in the windrow, but this not so that the leaves may continue to function. It is to prevent them from becoming so excessively dry that they will be lost through shattering.

When to the Barn?

The general rules observed by farmers when making hay have too wide a latitude to insure good quality. In one community the moisture content from samples taken from hay being put in the mow was found to vary from 17 percent to 42 percent. Hay that is allowed to remain in the field after it is fully cured soon loses quality. The sun bleaches the hay and may do serious damage to its vitamin content, and in legume hay there is a serious leaf-loss. The loss resulting from handling over-cured hay has been shown to amount to as much as 20 percent. The losses resulting from storing under-cured hay also are tremendous — losses in lower feeding value and lower market grade of heat-damaged hay, to say nothing of the possible loss of the barn and livestock as a result of spontaneous combustion.

During these studies hay was placed in the mow with as low as 20 percent and as high as 58 percent of moisture. Hay with below 30 percent of moisture ordinarily may be considered safe from heating to a destructive or dangerous degree. Hay with less than 27 percent of moisture may be expected to retain its green color.

It's all very well to say that hay is safe to go to the barn when it contains not more than 30 percent of moisture, but you may ask, "How is a farmer to know when the moisture condition is down to 30 percent?" The method in use by many farmers for years of deciding whether hay is dry enough for the barn, we found, works. This method consists of twisting a small handful of representative stems with the two hands until the stems twist in two and noting whether any moisture is brought to the surface by the twisting. If this twisting is repeated enough times to be sure one has representative stems, he can feel certain that his hay is not above 30 percent in moisture and is safe for the barn.

Hay baled directly from the windrow stored satisfactorily whenever the moisture was below 24 percent at the time of baling.

The value of salting hay in the mow was tested eight times with a distinctly beneficial effect only once, a slightly beneficial effect once and apparently no benefit in six trials.

How To Make the Mower Work Better

Condensed from American Agriculturist

I. G. Morrison

TWO mowing machines may look exactly alike, yet one may make a team of horses work 30 per cent harder although doing a much poorer job. A mower pulls hard because it is out of adjustment. Fortunately the right information plus a few tools and an hour or two of time will put the mower in shape to do a first class job. To work properly, a mower must have:

1. A cutter bar that is lined up properly;
2. Guards that are aligned;
3. Knives that are sharp and centered;
4. Knife clips that are tight.

While different mowing machine manufacturers have different directions, a good general rule is that a cutter bar should "lead" by a quarter of an inch for each foot in length. That means that instead of being absolutely at right angles to the pole and parallel to the axle, the outer end of the cutter bar is slightly ahead of the inner end. When the mower is operating, this lead is taken up by the work the knives are doing and by the friction on the ground so that the bar is at right angles to the pole.

A good method to check cutter bar alignment is shown in Figure 1. If it is not lined up properly, look at your instruction book, or, in most cases a checking up of the mower will show how to adjust the cutter bar and bring it back into alignment.

Guards badly out of alignment can be detected by sighting along the cutter bar (see "d" in Fig. 2) or a straight piece of strap iron, 15 to 20 inches long, run along the tops of the guard plates to see which are high or low. Pay no attention to points of guards, except as they influence the position of ledger plates. To have proper shearing action, it is important that the knives touch each guard plate. Guards which are out of alignment can be driven back into place by hitting with a hammer at the thick part of the guard. New guards are likely to be too high. This trouble can be remedied by putting tin shims between the guard and cut-

Reprinted by permission from American Agriculturist, Ithaca, N. Y., March 28, 1942

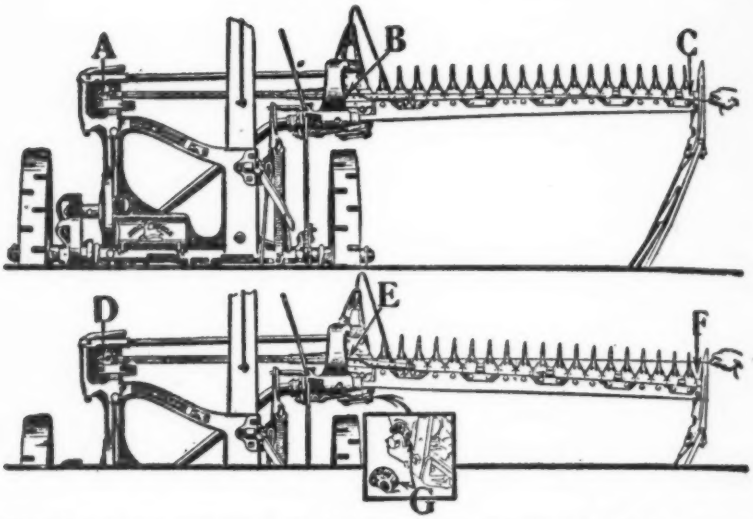


FIGURE 1. Here is one way to check the alignment of a cutter bar. Block the tongue up to normal position (32 inches from the ground) and adjust the lift spring so that the inside shoe is just floating. Then tie a cord to the oil cap on the pitman box (A above). Stretch the cord over the center of the knife head as shown at B and the amount of lead can be determined at C. The upper illustration shows a 5-foot bar with the proper lead (from an inch to an inch and a quarter), while the lower illustration shows a 4-inch lag. At G in this mower, there is an eccentric bushing which can be turned to take out the lag.

ter bar when bolted on. You may find, by sighting along the knife, that there are bends in it. If there are, they can be taken out with a hammer on a flat iron surface.

A knife that is properly centered rests right in the middle of one guard at one end of the stroke and at the center of the next guard at the other end of the stroke. To check this, raise the tongue of the mower to the point it would be when the horses are hitched on the machine and turn the fly-wheel first to one dead center and then to the other. If the knives do not center properly, you will find an adjustment to correct it. The adjustment differs on different makes of machines; in some the coupling bar running from the frame to the inner end of the cutter bar, is threaded at one end; in others provision is made for taking off or adding washers in order to center, or register, the knife. The adjustment will throw the inner end of the cutter bar forward or back.

If the knife clips are loose (see "i" in Figure 2), knives are not held closely to the guard plates and there is a tendency for grass to pull into the guards rather than for it to be cut off clean. Do not adjust these plates until the knife bar has been straightened and the knives centered, then, starting with the clip nearest the inside shoe, and with the knife out, tap the clip lightly with a hammer. After each tap run the knife under the clip to check tightness. If the clip is too tight, hit it a sharp blow just between the two bolts that hold it. There should be a clearance about equal to the thickness of a post card. In the same way continue tightening the clips along the bar, just enough so you can move the knife freely by hand.

Most mowers have a number of adjustments for taking up wear. A thorough inspection of the mower will show where there is excessive wear and the adjustment for taking it up is usually quite apparent. However, from the point of view of easy and satisfactory operation, the adjustments mentioned are the most important. If you want more detailed information, an excellent source is Farmer's Bulletin 1754, which can be secured by sending five cents to Superintendent of Documents, Government Printing Office, Washington, D. C.

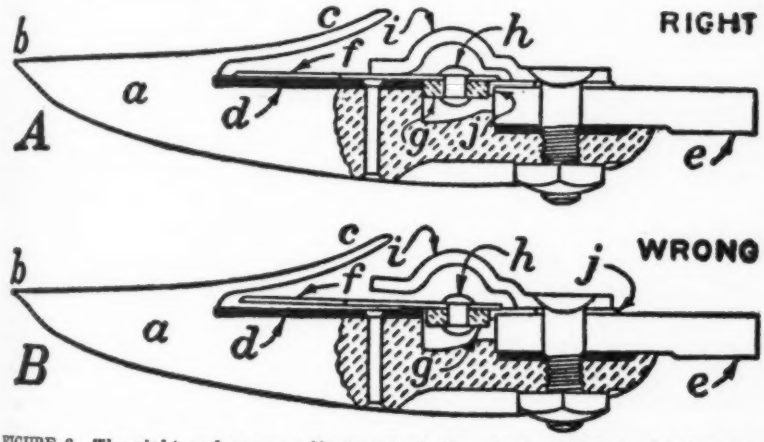


FIGURE 2. The right and wrong adjustment of clip. At A (which is right) notice that the knife "f" hugs the guard "d" closely and that the clip "i" touches the knife. At B (which is wrong) notice the space between "d" and "f" and that the clip "i" does not touch the knife. Notice also that the wearing plate "j" is worn, allowing the knife bar "g" to fit loosely in its groove and the back edge of the knife to drop, thus raising the cutting edge of the section "f" away from the ledger plate "d."

A Wagon Worth Millions

Condensed from Nation's Business

Don Wharton

WHEN James Lewis Kraft was a 16-year-old Ontario farm boy he went to his Mennonite father one night with a question: If he paid off the $4,000 mortgage on the farm could he then leave home, paddle his own canoe?

The father said yes and went off to bed. Next day the boy set out in an old democrat wagon, scouring the Canadian countryside for eggs to sell to hotels and retail shops in Buffalo. His business grew and soon he had to hire a man to help him. When he was 18 and had just reached his $4,000 goal, a tariff on eggs ruined his business.

That was 50 years ago. Today the boy from Ontario heads the world's largest cheese company. He has made us a nation of cheese eaters, taught us to eat twice as much as we used to. By spreading cheese production from coast to coast, he has helped lift mortgages off thousands of farms. More important at the moment, Kraft has made it possible for this country to produce the millions of pounds of cheese with which the beleaguered British are stretching out their daily rations. The United States is now exporting as much cheese every 48 hours as in the entire year 1939. This tremendous expansion could never have been accomplished but for the boy who wanted to get off the farm.

When his egg business was wrecked, young Kraft did not give up. A country school teacher had once told him a man could do anything he set his mind to. Kraft believed it then, believes it now. He wanted to go to business school—and did, getting up at five, walking 12 miles a day, sweeping and dusting for his tuition.

On his graduation, the only job he could get was as a delivery boy in a small-town general store. He took it, became a clerk, saved money, bought an ice business—and went into the hole when Lake Erie had its mildest winter in decades and there wasn't enough ice to cut.

Starting in a Strange City

Kraft saved more money to buy a small grocery store in Buffalo and was closing the deal the morning a bank failure wiped out all his funds. He helped organize a cheese company there; while he was looking after the Chicago branch, in 1903, his partners squeezed him out.

So there he was, 29 years old,

Reprinted by permission from Nation's Business, Washington, D. C., February, 1942

in a strange city, with only $65. Once again Kraft hitched his star to a wagon. Behind a horse named Paddy, he peddled cheese from store to store. His was the first cheese wagon in Chicago. The important retailers usually drove down to the wholesale section to pick out their own cheeses. Kraft built a business taking care of the small fry. It meant getting up at four, eating a ten-cent breakfast, sleeping in a room for which he paid $3 a week—the price including meals on Sunday.

Today Kraft's firm does an annual business of $130,000,000 but he still gets up early. He's in his office most mornings at 7.15—a full hour ahead of his employees. He says he likes to see the sun come up.

At that time there was no nation-wide cheese business. It was not practical to advertise a brand and distribute it nationally because the advertiser could not promise the housewife that she could get the same flavor twice in succession. No two cheeses tasted exactly alike, even the same cheese didn't taste the same very long—it got sharper as it aged.

Cheese had to be kept in cold storage. Both the merchant and the housewife had to put up with waste and spoilage. Scores of men, dreaming of national markets, had tackled these defects and had been licked. They had tried cutting cheese into cubes and wrapping it in foil; grinding and packing it into jars; slicing, shredding and squeezing it. Kraft himself had run cheese through a sausage grinder, packed it in jars and sold it—until warm weather came on, causing the bacteria to grow, the cheese to swell, the jars to burst. This experience gave Kraft an idea:

Milk is pasteurized, why not cheese? Why not kill the bacteria after they had done their work, thus halt the ripening and get a cheese that would keep?

Kraft had no scientific training, no laboratory—only an idea and the determination to push it through. Back of his store was an improvised kitchen. Here he put some cheese in an oatmeal cooker, heated it—and got a stringy mass which he threw away. The fats in the cheese had separated from the casein.

He tried cooking cheese fast, slow, with high temperatures and low. He tried cooking it wrapped in tin foil and then in jars with ingenious air vents. Nothing worked.

In 1913 a clue turned up when he wasn't looking for one. Making packaged Welsh rarebit—to sell off a supply of poor cheese from Holland — Kraft noticed that the fats did not separate and wondered if it was the albumen in the eggs. Kitchen experiments proved him right and in May, 1915, he was the first man to pas-

teurize cheese successfully. Then it occurred to him that, though albumen was perfectly harmless, the pure food people might object to anything being added to cheese. He had noticed that more stirring made the product smoother; was it possible that separation might be prevented by vigorous stirring alone?

It was — and the pasteurized cheese business was born. The manufacturer could guarantee that his cheese would keep, that its flavor would not change, that each lot would taste like any other, since he could blend various raw cheeses to get the precise flavor he wanted.

Kraft sold $5,000 worth of pasteurized cheese in tins in 1915, the first lots going to India and the Orient. The next year, sales went up to $150,000. Then, with the United States in the war, he began selling to the Army and Navy—one order alone was for 2,000,000 pounds. After the war, cheese in tins was succeeded by cheese in loaves.

The business grew. Other companies began pasteurizing. Consumption was increasing so rapidly that Kraft feared production couldn't keep up—that prices would rise and in turn shut off consumption.

So, while pumping up sales of his pasteurized product, he began trying to increase production of cheese.

Encouraged More Production

At that time Wisconsin was producing 70 per cent of our cheese, New York and Pennsylvania together 20 per cent. Kraft's dream was cheese production in every state. In 1922 the governor of Idaho came to him with a sad story of farmers going broke raising potatoes and alfalfa. He wanted Kraft to come out and help.

Middlewestern dairymen looked the state over and said Idaho would be great dairy country but they couldn't see what could be done about it. Then Kraft announced that, if the banks would help farmers buy cows, he'd agree to buy every pound of cheese produced in Idaho for the next ten years. Further, he'd pay Wisconsin prices.

Some of the dairymen thought Kraft had let his enthusiasm run away with him.

But Kraft knew that 30,000,000 pounds of Wisconsin cheese was being shipped to the West Coast every year at freight rates double what Idaho cheese would have to bear; his offer was long-headed business. Idaho cheese production increased seven-fold in a decade.

Soon Kraft was approached by some people in Montana's Bitterroot Valley which had gone broke trying to raise apples. Then he moved into the Star Valley of Wyoming, into Utah, Indiana,

the South and the Southwest. Sometimes he was invited, sometimes he pushed in.

Always he carried simple ideas: get away from one-crop economies, get off credit and onto a cash basis, produce cheese near each market. He wanted more and more cheese, to process, advertise and sell. But he did not want gigantic factories concentrated in one section. He believed in decentralization.

Today he has 8,000 employees but they are scattered all over the nation. He has cheese factories in 23 states and works with farmer co-operatives in all the others except Florida and Louisiana. Paddy, the cheese wagon and one route have become 2,000 fast motor trucks operating out of 250 branches. The man on the truck, like Kraft on his wagon, is a salesman as well as a driver.

Little Factories and Big Volume

In 1920, only three states were producing as much as 10,000,000 pounds of cheese each. Last year there were 17 such states. This expansion, pioneered by Mr. Kraft, is today paying precious dividends. Out of little factories dotting hundreds of valleys flow streams of cheese to help the British stave off hunger. Last April the Government called on the industry for 250,000,000 pounds of cheese in 15 months. That's the greatest cheese order on record—nearly half as much as our total production in 1940. And it's being delivered without curtailing American consumption.

By November the fabulous pace of 4,000,000 pounds a week for Britain had been achieved.

Everywhere increased production depended upon the coast-to-coast network of factories and trained personnel built up over two decades.

On September 30, the Government phoned Kraft that it must have 2,000,000 pounds of cheese in Baltimore in six days. It looked impossible.

Phones began buzzing—and it still looked impossible.

Then, down in the Ozarks—where cheese-making was unknown until Kraft pioneered—long distance found a Kraft manager who'd figured someone might be wanting cheese in a hurry. He had ten railway cars on a siding, already loaded with cheese.

Kraft's factory in Australia has supplied Anzac troops, particularly those in Egypt. Cheese from his British factory is stocked in British Army canteens. Our own troops ate 500 tons of Kraft's pasteurized cheese in the course of the Louisiana and Carolina maneuvers.

Developing Specialty Cheeses

The mass market, which likes a bland, mild cheese, is conquer-

ed. Now Kraft is reaching out for the connoisseurs who, until now, have bought imported specialties.

Up in northern Illinois, George Pulkrabek, a Kraft man, has recently perfected processes for production of Edam and Gouda cheese — Dutch types which necessitated vast amounts of hand labor until Pulkrabek got them rolling off assembly lines at the rate of 2,500 pounds a day.

At St. Paul, Kraft is using caves along the Mississippi River to cure a Roquefort-type cheese; the caves, dug 50 years ago for apple storing, provide humidity of 95 and a temperature always hovering between 50 and 52 degrees — hottest in November, coldest in June. Here you can see 450,000 pounds aging in caves which rent for $12 a month each.

Kraft suggests that our *per capita* cheese consumption—now six pounds against three in 1911 —will eventually rise to 12 pounds, and somehow, you don't doubt him.

This blue-eyed, stocky man is not the type you ever doubt. His predictions have a way of coming true. In his mind Kraft has always had a pattern of the future. He was thinking of the biggest cheese business in America when he had only one horse and wagon. One by one he brought his brothers off the family farm until eight were working together in Chicago. Five of the Kraft brothers have been there now for 33 years.

Each year 32 4-H Club members go to college on Kraft scholarships. He gives much time to the 4-H.

Soldiers on leave in Chicago, Kraft employees he has never seen, come in to say hello to "J. L." The pioneer from Ontario has built more than an industry.

Farmer's Chemist

The discovery that turnips are among the first to fail when the boron supply in the soil declines a little, has been turned to good use. Now a few are planted on many farms in order to test the supply of boron for other crops. If the turnips grow well, the proof is positive that the soil has enough boron for any other common crop. If the growth is poor and the leaves are discolored and deformed, the time has come to add 15 to 20 pounds of boron to each acre of soil. Sunflowers make good boron testers, too.

Advantages of these plant "chemists" over human chemists: (1) they need no expensive laboratory. (2) Their testing is done under the actual field conditions existing for the crop that is to be grown.

—*New Jersey Agriculture*

Legume Inoculation as a Source of Nitrogen and Protein

Condensed from The Rural New-Yorker

Fremont Conrad

WITH the nation about to embark on the greatest agricultural production program in its history, every means of increasing crop yields will deserve the utmost attention. One of the most vitally needed plant foods is nitrogen, and with commercial nitrates in demand for the manufacture of explosives, farmers can get part supply of nitrogen from the air through inoculation of legumes.

Legumes are a source of nitrogen and protein. Concerned with the price increases that have taken place in mill by-products and protein concentrates, farmers are planning to embark on an extensive grow - your - own protein program. Legume inoculation offers a certain means of increasing both the yield and protein content of legumes, and at the same time increasing the fertility of the soil for other crops to follow.

Legumes have the ability to take nitrogen out of the air only when helpful bacteria attach themselves to the roots and form the characteristic nodules.

Inoculation of legumes is recommended at every seeding, regardless of whether that particular legume has been grown on the same land before. There is no rapid test to determine whether there will be a sufficient number of the right kind of nitrogen fixing bacteria present in the soil before seeding. Inoculation with selected and proved strains assures an immediate, beneficial association and an early fixation of nitrogen. Most commercial inoculants are packed in dated cans, in moist humus which maintains the strength and vigor of the bacteria.

The importance of liming has been demonstrated conclusively in legume culture. Cornell University reported that red clover grown on limed soil produced 39.9 percent more dry weight when the seed was inoculated, while on unlimed soil inoculated seed produced 32.2 more dry weight.

Research workers at the University of Missouri have demonstrated a new function of periodic liming. It was found that it was not only important to maintain the desired alkalinity of the soil, but to provide the abundance of calcium needed by both the le-

Reprinted by permission from the Rural New-Yorker, 333 W. 30th St., New York, N. Y., April 4, 1942

gumes and the nitrogen fixing bacteria. A deficiency of calcium was found to encourage attacks of a damping-off type of fungus and brought failure of inoculation. It was demonstrated further that calcium was necessary to support legume bacteria in the soil and to keep them normal, effective inoculators.

Inoculated legumes improve the fertility of the soil, as evidenced in the increased yields obtained in crops that are planted on the same ground the next year. To obtain the greatest benefit the inoculated legume must be returned to the soil. If it is not plowed under, then it should at least be returned in the manure from the livestock to which it has been fed. Alfalfa and sweet clover can be cropped and still return more fertility to the soil than soybeans, for they have a more extensive root system.

The Ohio Experiment Station reports that corn following sweet clover yielded 49.4 bushels; following red clover, 42.3 bushels; and following no legumes, only 31.3 bushels. The Arkansas Experiment Station reported that a yield of corn following soybeans was 45 percent greater than corn following oats. New York reports that barley following alfalfa yielded 68.8 bushels, and following timothy 25.7 bushels.

The Minnesota Experiment Station found that inoculation increased the yield of alfalfa hay 1,729 pounds per acre, and a gain of 1,120 pounds per acre was obtained at Illinois. University of Wisconsin experiments reported a gain of 1,151 pounds of alfalfa hay per acre due to inoculation. All these yields represent a gain of over half a ton of alfalfa hay per acre, an average increase of over 40 percent, at an average cost of 12 cents an acre for inoculation.

It costs no more to prepare the land to grow a good legume crop than it costs to grow a poor one. The extra yield and higher quality of the hay proves that it pays to inoculate each seeding. Equally important, failure to get a good stand of alfalfa or clover will prove a severe setback to any crop rotation and soil improvement program.

There is a marked improvement in the feeding quality of inoculated legume hay. The heavier growth of dark, green leaves seen in inoculated legumes indicates that they contain more protein, which means more milk and faster gains when fed to young stock, calves, hogs or poultry. Legume hay is unequaled as an abundant source of calcium also.

Wisconsin studies reveal that a ton of soybean hay contains 51 pounds of protein; field pea hay, 48.4 pounds; alfalfa hay, 47.6 pounds; and red clover hay, 41 pounds. Non-leguminous forage

crops contain less protein - timothy hay but 19.8 pounds protein; corn fodder, 21.4 pounds; blue grass and oat hay, 26.6 and 26.8 pounds respectively.

Ward W. Walton, of Upper Sandusky, Ohio, was reported to have sown red clover seed on 30 acres of winter wheat last Spring. He had been growing red clover on his 200 acre farm with reasonable success for the past 20 years, but he decided to try a commercial inoculant on one-half of the seed, just to see if there would be any improvement.

The field was divided in half, and in April, 15 acres were sown with inoculated seed while the remaining 15 acres were sown with uninoculated seed. The inoculated plants got off to an early start. The difference in color and growth could be seen all through the Summer, and when the winter wheat was harvested the red clover yielded 30 bushels of first quality seed, free from weeds.

The uninoculated half of the field came up with such a poor stand and was so overrun with weeds that it did not pay to harvest it at all. Mr. Walton found that his investment in 75 cents worth of commercial inoculant and the few minutes of time that was required to mix it with the seed returned $390, for that was what the 30 bushels of red clover seed would have brought on the market at $13 a bushel.

Inoculation of cash crop legumes such as canning peas, soybeans, field peas, and beans often pays dividends in a large yield per acre, a better grade, and a better price. There is less difficulty in controlling weeds because the inoculated crop will grow faster and stay ahead of the weeds. Soybeans drilled in rows will need less cultivation because they will shade the rows sooner. The time and labor saved will permit the care of other crops, or allow more time for many conflicting duties in the height of the haying and cultivating season.

Certain legumes group themselves into cross - inoculation groups, which makes it possible for the manufacturers of commercial inoculants to pass an economy in production on to farmers. For a time it was thought that almost every legume required a specific nitrogen-fixing bacteria, but it is now known that effective cross - inoculation can be obtained with different strains of one organism for each of the following legume groups:

CROSS INOCULATION GROUPS IN LEGUMES

"A" Culture—For Alfalfa, all Sweet Clovers (including Hubam), Bur Clover and Black Medic.

"B" Culture—For Red, White, Alsike, Crimson and Mammoth Red Clovers (all of the Trifolii).

"C" Culture—For Field and Garden Peas, Vetches (Hairy, Spring, Monantha, Purple) Broad Beans, Sweet Peas, Perennial Peas and Lentils.

"D" Culture — For Field and Garden Beans (including Kidney and Navy) and Scarlet Runner Beans.

"E" Culture — For Cowpeas, Velvet Beans, Peanuts, Kudzu, Partridge Peas, Beggarweed, Lima Beans, Mung Beans, Tepary Beans and Crotolarias.

"L" Culture—For Lespedezas (all varieties).

"S" Culture—For Soy Beans (all varieties).

Farmers have long known the value of legumes in improving their soil and the yield of their crops, and with the additional benefits obtained through inoculation they cannot afford not to invest in this most inexpensive and effective form of crop insurance.

Barn-Cured Hay

Ohio State University agricultural engineers recently announced it is practical to store alfalfa hay in the mow the same day it is cut, by use of the forced ventilation method developed at the University of Tennessee.

Miller and Shier, of the engineers' staff, observed this method in operation on two Ohio farms where hay containing 50 percent moisture was successfully cured without fire hazard or damage last summer. The value of the hay thus cured was greatly increased because the leaves were not shattered. The hay was also superior in color, grade, and protein to field-cured hay. Flues in the mow were spaced about five feet apart on the mow floor and a maximum depth of 18 feet of hay above the flues observed. The total cost was found to be less than one dollar per ton of dry hay, which represented largely the expense of operating the fan. The cost of all equipment and installation to operate a 20-ton capacity mow was $292, and it is estimated the equipment should last 20 years.

—*Successful Farming*

How To Calculate Parity Prices

Condensed from The Southern Planter

Paul R. Poffenberger and S. H. DeVault

Department of Agricultural Economics, University of Maryland

THE term "parity price" has been in use for several years, but its meaning is not clear to many people. The recent price control legislation renews increased interest in parity prices and price relationships.

Parity price is that price received by farmers for their products which would give those products the same purchasing power in terms of non-farm goods purchased as they had during the base period of 1909 to 1914. The relationship which exists currently between the average price of a specific commodity for the base period and the varying index of prices paid by farmers for commodities purchased indicates the current parity price for individual commodities. Parity price is not a fixed price, but it is a relative price which changes as the index of prices paid by farmers changes.

How is parity price calculated? Generally, except for those commodities requiring special weighting and seasonal adjustment, parity price is figured by multiplying the average farm price of a commodity for the base period (1909 to 1914) by the index of prices paid by farmers for all commodities purchased, including interest and taxes. For example, the average price of hogs in the base period was $7.22 per 100 pounds and the index of prices paid by farmers, including interest and taxes, for February 15, 1942, was 147 per cent of the base period. The following calculations indicate the parity price of hogs for February 15, 1942: $7.22 times 147 equals $1,061.34; $1,061.34 divided by 100 equals $10.61, the parity price for hogs. By this process parity price for any commodity may be readily calculated.

Should a farmer desire to know what 110 per cent of the parity price of a commodity is, he should take the parity price and add 10 per cent to it. For example, the parity price of hogs per 100 pounds for February 15, 1942, was $10.61; 10 per cent of this price equals $1.06; 1.06 plus $10.61 equals $11.67, which is 110 per cent of the parity price for hogs as of February 15, 1942.

Reprinted by permission from the Southern Planter, 223 Governor St., Richmond, Virginia, April, 1942

If a farmer wishes to know what percentage the current farm price is of the parity price, the following calculations will supply the information: Divide $11.67 per 100 pounds (the price received for hogs as of February 15, 1942,) by $10.61 per 100 pounds (the parity price for the same date); $11.67 over $10.61 equals 110 per cent of parity. On corn, for example, with the farm price at 76.6 cents per bushel on February 15, 1942, and the parity price at 94.4 cents per bushel, the current price of corn would be 81.1 per cent of parity: 76.6 divided by 94.4 equals 81.1 per cent of parity.

The concept of parity prices is not confusing or complicated if the few simple facts and calculation heretofore mentioned are kept in mind. It must be remembered that the disparity between current actual prices and parity prices varies considerably for different agricultural commodities. In other words, the prices of some agricultural commodities are above parity, while the prices of other commodities are below parity. It is apparent, then, that all producers of agricultural commodities will not fare equally well by virtue of the parity price concept and its effect on the price of farm products.

Since parity price is influenced by the price of commodities bought by farmers, naturally items of cost entering into the price of these commodities, of which labor or industrial wages is most important, will eventually be reflected in the parity price of farm products. The current farm price and the parity price for the same commodities need not necessarily move in the same direction, but may be in converse relationship.

As far as the parity concept is concerned, however, it is not the actual price of a commodity that is of paramount importance, but rather the purchasing power of that commodity. From the sale of a specific commodity, will a farmer be able to buy as much of the same non-farm goods as he was able to buy during the pre-war base of 1909-14? That is the question a farmer should want answered in regard to whether or not the price of a farm commodity has reached parity.

A casual review of the following table reveals the relative status of the current price and parity price for a selected list of commodities of the United States.

Commodity and unit	5-year average August 1909 to July 1914	Actual price, Feb. 15, 1942	Parity price, Feb. 15, 1942	Actual price as per cent of parity price, Feb. 15, 1942
Wheat, per bushel.....ct.	88.4	104.9	129.9	81
Corn, per bushel.....ct.	64.2	76.6	94.4	81
Oats, per bushel.....ct.	39.9	52.0	58.7	89
Barley, per bushel.....ct.	61.9	62.8	91.0	69
Rye, per bushel.....ct.	72.0	66.0	105.8	62
Potatoes, per bushel.....ct.	69.7	104.5	104.7	100
Sweet potatoes, per bushel.....ct.	87.8	98.6	129.1	76
Hay, per ton.....dol.	18.87	10.76	17.45	62
Tobacco, Md., type 32, per pound....ct.	22.9	30.0	21.1	142
Apples, per bushel.....dol.	.96	1.20	1.41	85
Hogs, per 100 pounds.....dol.	7.22	11.64	10.61	110
Beef cattle, per 100 pounds.....dol.	5.21	9.93	7.66	130
Veal calves, per 100 pounds.....dol.	6.75	12.05	9.92	121
Sheep, per 100 pounds.....dol.	4.53	5.62	6.66	84
Lambs, per 100 pounds.....dol.	5.87	10.48	8.63	121
Butterfat, per pound.....ct.	26.3	36.2	39.5	92
Milk, wholesale, per 100 pounds....dol.	1.60	2.59	2.35	110
Chickens, live, per pound.....ct.	11.4	17.4	16.8	104
Turkeys, live, per pound.....ct.	14.4	20.0	21.2	94
Eggs, per dozen.....ct.	21.5	27.5	27.8	99
Wool, per pound.....ct.	18.3	37.1	26.9	138

Midmonth Local Market Price Report, Agricultural Marketing Service, U. S. Department of Agriculture, February 27, 1942.

Manure

Repeated experiments by the Wisconsin Experiment Station have shown that light applications of manure made frequently at the rate of four to six tons result in greater returns per ton of manure than heavy applications made less often. In one experiment, carried out over a nine-year period on a three-year rotation of corn, grain, and clover, four and one-half tons of manure topdressed for the corn crop increased the per-ton value of the manure to $2.45 per ton, as compared with $1.78 where nine tons were used at one application.

—*Successful Farming*

Farmers Build a Market

Condensed from Extension Service Review

George J. Funke

County Agricultural Agent, Boundary County, Idaho

FEW indeed are the farmers who can always find a ready market for all the miscellaneous products they raise which are not available in sufficient quantity to market through the major marketing channels; and many are like the farmers in Boundary County, Idaho, who have had trouble for years in exchanging their produce for the good hard cash a farmer always requires.

With the establishment of a community auction market last spring, however, the farmers in Boundary County have begun solving this problem and perhaps are showing the way for other communities to solve their own.

The Boundary County solution calls for holding community auction sales on alternate Saturdays. On sales day, farmers and townspeople from Boundary and neighboring counties assemble at Bonners Ferry to bid upon produce and other articles offered for sale. This is the place where Farmer Jones may find the feeder pigs he wants to buy to make use of the extra skim milk from his Guernsey herd, or where Farmer Smith can find the walking plow he has been seeking. The City Housewife can buy the fat hen she needs for Sunday dinner, and the Farmer Housewife can sell the culled hens from her flock without peddling them from door to door in the towns.

This community enterprise was initiated through the activities of the agricultural planning committees of the county. The county has 4 community committees, each of 10 to 12 farm men and farm women. Every part of the county is represented on these groups. The county committee includes the chairman, vice-chairman, and secretary of each community committee and a representative of each governmental agency that works with agriculture.

When these committees organized in January, 1941, one of the first problems attacked was the need for exchange of produce and articles needed on the farm. Investigation showed that people who had things to sell often had a hard time finding a buyer, and

Reprinted from the Extension Service Review, Washington, D. C., April, 1942

buyers had the same difficulty in finding a seller. Posting notices on public bulletin boards helped some but did not do the job needed.

The chairman of the county committee designated a subcommittee to investigate marketing methods used in other communities. Each community committee was also asked to contact their farmers to discuss the marketing situation and get suggestions for their solution. Facts were obtained from community auction managers in southern Idaho, eastern Washington, Minnesota, Kansas, and Colorado. Several sales yards were visited to obtain first-hand information.

At the next meeting, the county committee reviewed the information thus obtained. The community committees reported that most of the farmers seemed to favor setting up a public market where articles could be bought or sold on a competitive bidding basis.

On this basis, the county committee then drew up definite plans, rules, and regulations for a community auction sale and instructed the committeemen to present the plans to their neighbors for their suggestions. A very favorable response was received, and the committee decided to arrange for the public market.

Donald Hoagland, a farmer with auctioneering experience, was selected to manage and operate the sales on a private basis, with the understanding that he would follow the suggestions of a supervisory board selected by the county planning committee.

The planning committee outlined several policies to be followed by the sales manager. These were: First, that the sale was established to develop a market for local produce and that import of articles for sale was not to be encouraged unless there was definite need for the introduction of some commodity, for example, dairy calves; second, that the seller should have the right to place one reserve bid on any article for which a value can be established; and third, that precautions should be taken to prevent the spread of disease in livestock and poultry.

The city council granted permission to use a vacant lot near the post office, and a barn next to the lot was rented for housing livestock. Sales were held outdoors all summer. Large crowds came, and the prices received for listed articles were good.

Last fall the rains and an increasing volume of business made it necessary to acquire a sales building. After investigation, a large barn, corrals, and parking lot at the edge of town were rented; and adequate facilities for selling, storing articles, and caring for livestock are now being prepared.

Artificial Udder Growth and Milk Secretion

Condensed from The Jersey Bulletin

A. A. Lewis
University of Missouri

RECENT research work at the University of Missouri points the way to the artificial initiation of milk production in sterile cows. Have you ever thought why the udders of heifers increase in size after breeding and then swell with milk before calving? You say that is part of the natural process of a cow preparing to nurse her calf, but nature must work in the animal body by definite processes. These can be ferreted out by research methods. For some time investigators have been working on this problem but only recently has it seemed that artificial udder growth and milk production may be put on a practical basis.

Early in the study of udder growth it was found that the external form and supporting structures of the udder are laid down before birth. Subsequent development, especially after sexual development and breeding, alter and mature the udder but the fundamental form is present at birth. The mammary glands or secreting tissue, in which we are principally interested, are very undeveloped at birth and even until puberty. It was found that when the ovaries begin functioning there begin to sprout out cords of cells from the undeveloped ducts and gland cistern. These become hollow, branch and grow more and more throughout the udder. This growth has a rhythm in time with that of the sexual cycles of the heifer.

In trying to discover what caused this spurt of growth in virgin heifers, investigators noticed the correspondence between mammary gland development and the beginning of changes in the ovaries which are characteristic of the sexual cycle. A theory was first advanced in 1911 that the development of the mammary gland was due to secretions of the ovary. The first really successful experimental growth of the mammary gland was accomplished about this time and two years later in Europe with extracts of ovaries and fetal membranes injected into laboratory animals. Previous investigators had obtained inconclusive results

Reprinted by permission from The Jersey Bulletin, Indianapolis, Indiana, April 8, 1942

because they made water extracts whereas it was found that the active agent was a fat-like substance and fat solvents were required for extracting it.

Little more was learned of the causes of mammary gland growth, however, until the 1920's when a great increase in knowledge of ovarian secretions was obtained. Crude extracts of ovarian structures were found to be effective in causing, in normal as well as castrate animals, the changes which occur in the normal animal during the sexual cycle. When these extracts were given continuously to animals with undeveloped mammary glands the ducts developed to the full extent found in the virgin animal. The teats also developed to the mature condition. Most of this investigation was done on small laboratory animals. The expense of purchase and feeding of cattle made prohibitive their use in preliminary work and the complexity of their mammary glands make study difficult. It was found that in most species studied ovarian extracts would cause only the growth of the mammary ducts and alveolar buds.

About 1930, chemists were able to isolate and crystallize several forms of the ovarian hormone, estrogen. Estrogen is found in most active form in the white, watery ovarian sacs called follicles in which the egg cell matures. When it is mature, the follicle bursts releasing the egg cell into the oviduct and uterus. In place of the follicle there forms a more solid structure called the corpus luteum which also secretes a hormone. This hormone has been purified and is called progesterone. These secretions from the follicle and corpus luteum are released into the blood stream where they are carried to the organs they are to affect.

The use of these crystalline estrogens has been extensive in experimental growth of the mammary glands in laboratory animals. The results of the use of crude extracts have been confirmed. Estrogenic chemicals cause mammary duct growth when injected into animals. Estrogens are also effective when a hard pellet of the chemical is implanted under the skin or even when painted in solution on the shaved skin of the animal. From one to five weeks treatment is required to produce large glands in laboratory animals.

Only during pregnancy is the growth of the mammary glands completed by the development of the lobule-alveolar system of the gland. This is caused during the first two-thirds of pregnancy by the action of the hormone progesterone in combination with estrogen. They are produced first by the ovary and then by the

placenta. Experimental injection of these two hormones in pure form in proper proportions will develop the mammary glands of even virgin animals.

During the last third of pregnancy the mammary alveoli (secreting sacs) begin activity. The first secretion is watery in nature but gradually changes until it is like colostrum, high in protein and other solids. If milking is begun the colostrum will change to milk but the quantity will not be large.

About calving time there is a great surge of secretion in the udder and when milking is begun the cow comes into full lactation increasing for a month or two. This great increase in secretion at calving time is due to the action of the hormone estrogen on the pituitary gland causing an increase in production of the pituitary lactogenic hormone. The pituitary gland is a small organ located at the base of the brain. It is the organizer of the entire hormone system of the body secreting hormones which affect many of the body processes. One of the hormones produced by the pituitary is called lactogen. This is the hormone whose primary action is to initiate and maintain lactation. It has been found that if the ovarian hormone, estrogen, is given to an animal, besides causing growth of the mammary glands it will cause a great increase in the output of lactogen from the pituitary. If the mammary glands are ready at that time they will begin to produce milk. This outpouring of lactogen at calving time can be imitated by injecting under the skin an extract of the pituitary gland which contains lactogen.

The fundamental research on the causes of growth of the mammary gland and the control of milk secretion during the past few years has brought to light the broad problems which are involved before practical use may be made of the knowledge in this field. From the knowledge now available it is possible to grow the mammary duct system of laboratory animals comparable to that observed in unbred females, to complete the growth of the gland which takes place during pregnancy and finally to initiate the lactation process which normally follows birth of the young. It is believed that there will be a number of practical ways by which advantage can be taken of this scientific research. For example, a considerable number of dairy cows are culled from our herds because they fail to breed. Many such animals might have a long productive life ahead of them if their milk secreting function could again be stimulated and maintained.

To gain a picture of the problems involved in stimulating lac-

tation in sterile cows, it should be pointed out that the gland must first be grown if an approach to full milk yield is to be attained and then secretion of the lactogenic hormore must be greatly increased. In the past the following obstacles have prevented the application of scientific knowledge to attain this goal: 1, high cost of the necessary hormones; 2, ineffectiveness of the hormones when fed; and 3, expense of frequent injections of hormones. The synthesis of a chemical, called stilbestrol, may be the first in a series of discoveries which it is hoped will change the entire outlook for the early practical usefulness of scientific knowledge in relation to this problem. Let us consider the cost and some of the properties of this material.

On a weight basis, this chemical can be produced at much less cost than the natural estrogenic hormones. In addition, we found in experiments on small animals that it is fully as active on a weight basis as the best of the natural estrogens in stimulating growth of the mammary duct system.

Most hormones must be injected. Stilbestrol can be injected but it can also be given orally and still grow the mammary glands. Added to the water or the feed, the problem of administration would be reduced to a mimimum. It is interesting to note that stilbestrol is also effective when rubbed upon the skin. Pellets of stilbestrol when implanted under the skin gradually release the hormone into the blood effectively for several months.

While stilbestrol is considered as having chiefly the properties of the estrogenic hormones from the ovary, it appears to have additional properties. In experiments at the University of Missouri with mice, rats and rabbits, we observed that stilbestrol caused the growth of the mammary duct system comparable to that caused by natural estrogens. Furthermore, it actually carried the development toward that observed in early pregnancy when the lobule-alveolar system begins to develop. On the basis of these observations it seemed desirable to extend our experiments with stilbestrol to dairy animals.

We had an aged, sterile cow available which had not given milk for three years but had been used on metabolism experiments. We began injecting two milligrams (0.03 grain) daily of stilbestrol dissolved in oil under the skin of her neck and milked her once daily. Only one of her quarters responded, gradually increasing to two pounds a day and finally to 2.5 pounds. This cow produced milk for over eight months. It was found later that the other three quarters had de-

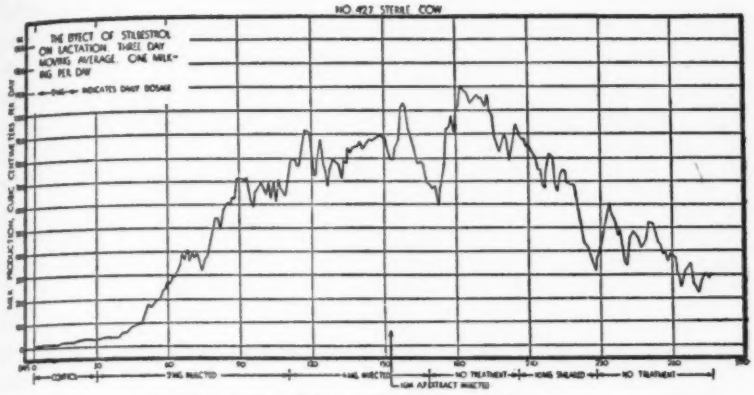
generated due to mastitis infection so that the main ducts were closed and the milk secreted could not escape. On the basis of four normal quarters, this cow should have produced 10 pounds of milk a day. A virgin heifer and a sterile cow were treated with stilbestrol by workers at the Louisiana State College. After a preliminary period of treatment, during which the udder began to fill with milk, milking was begun. Several pounds of milk a day were produced. This increased on a further treatment and reached 16 pounds a day from the heifer and 14 pounds from the cow. The milk was quite normal in composition.

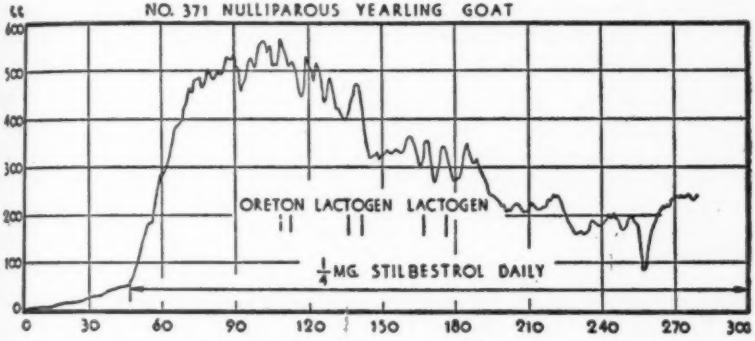
It is more difficult and expensive to secure dairy cows on which to conduct experiments than goats so that we have had more experience with the stilbestrol treatment of virgin and dry goats than with cows. In the matter of milk secretion goats should react very similarly to cows.

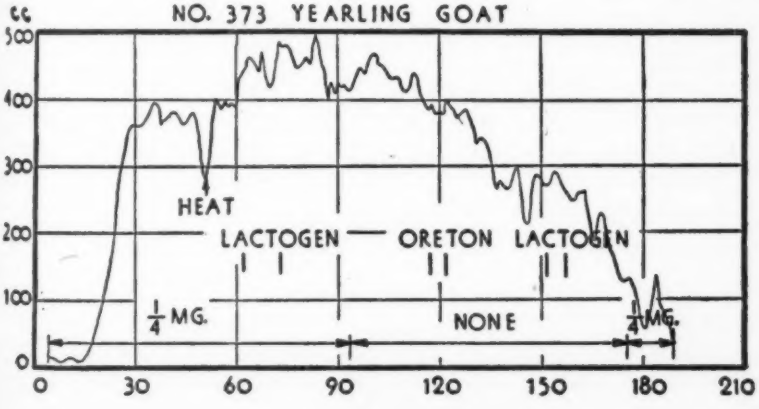
We have been able to cause the production of considerable quantities of milk for prolonged periods in nine virgin or dry goats. Three of these goats have been dried up after one artificial lactation and have then been brought into production a second time, making twelve lactations in all. Individual goats have produced milk for as long as twelve and fifteen months at a time on this treatment. The maximum daily production we obtained was not as much as these goats would have produced after natural kidding but two of them produced as much as 2.3 pounds a day. Yearling virgin goats gave about 1.5 pounds daily, which was about half what we would expect from similar goats which had kidded normally. Better production has been reported from another laboratory where virgin goats treated with stilbestrol reached 4 pounds of milk a day.

We found that injecting stilbestrol dissolved in oil beneath the skin was the most efficient method of experimentally bringing dairy animals into milk production. Rubbing stilbestrol dissolved in alcohol or oil into the udder is also quite effective but requires about 15 times as high a daily dosage. Feeding the chemical has been found to be very effective in laboratory animals and women but we were rather disappointed with the results in our trials. A very effective and labor saving method of giving stilbestrol is to inject

Top—Fig. 1. The lactation of a sterile cow due to treatment with stilbestrol. The first 30 days no treatment but milking was given. Then 2 mg. milligrams of stilbestrol in oil were injected daily. Center and bottom—Fig. 2. Lactation curves from virgin goats treated with stilbestrol. No. 371 milked for seven more months equaling the production shown here. No. 373 was treated with stilbestrol for only half the lactation.


NO. 427 STERILE COW
THE EFFECT OF STILBESTROL ON LACTATION. THREE DAY MOVING AVERAGE. ONE MILKING PER DAY
INDICATES DAILY DOSAGE
CONTROL
2 MG. INJECTED
1 MG. INJECTED
NO TREATMENT
10 MG. INJECTED
NO TREATMENT
10M APISTRACT INJECTED


NO. 371 NULLIPAROUS YEARLING GOAT
ORETON LACTOGEN LACTOGEN
1/4 MG. STILBESTROL DAILY


NO. 373 YEARLING GOAT
HEAT
LACTOGEN
ORETON LACTOGEN
1/4 MG.
NONE
1/4 MG.

crystals of the chemical, suspended in water, beneath the skin or to place a hard pellet under the skin through a small cut. Such pellets are slowly absorbed for months.

In the case of injections and smearing stilbestrol on the udder, it has been reported that treatment two or three times a week is just as effective as daily treatment. We also found that all treatment could be stopped after the animals reached their peak of production and they would continue to lactate for several months with a declining curve of production. If treatments were continued, however, production tended to be prolonged. There is evidence that daily treatment for a week at monthly or bi-monthly intervals may maintain production better than no treatment.

We found that a total extract of the pituitary gland, which can be obtained from your local veterinarian, was very useful in combination with stilbestrol treatment. Sometimes a cow may not respond to the stilbestrol treatment, but a gram of pituitary extract injected under the skin will bring it into production. We also found that injections of this extract given at about monthly intervals would cause considerable increases in milk production in stilbestrol treated animals, sometimes even doubling production.

The stilbestrol treatment of dairy animals was found to cause the development of milk secreting glands almost the same as those found after normal calving. The use of the other ovarian hormone, progesterone, would probably speed up and increase this udder development improving the milk production with stilbestrol treatment, but it is still very expensive.

Stilbestrol was found not to affect the growth rate or health of dairy animals. It tends to cause the ovaries to become inactive while treatment is continued unless given in low dosage. This effect should not be permanent, the ovaries recovering normal function after the stilbestrol treatment is stopped. We were able to bring into heat two previously stilbestrol treated goats out of season with a preparation from pregnant mare's serum. One conceived and bore a normal kid.

Stilbestrol treatment of cows which are in milk due to normal breeding does not seem to have any beneficial effect on the amount of milk produced and may even reduce the milk flow if too much is given. Where a low dosage is used so that milk production is not reduced, stilbestrol may have a beneficial effect in increasing the butterfat percentage of the milk and some of the other milk solids. Stilbestrol should not be given to pregnant cows for it may cause abortion.

From the above discussion it is clear that stilbestrol will cause the production of one-half or more of the normal volume of milk in dry cows. The use of an anterior pituitary extract is of considerable benefit at times.

There are also other circumstances in which the use of stilbestrol in dairy animals should be of great benefit. Recently Dr. Allen reported in the Jersey Bulletin his idea that stilbestrol could be used to reduce production somewhat just before and after calving in order to avoid milk fever. Many first calf heifers have a harmful swelling of the tissue around the udder before calving and a painful condition of the udder. Stilbestrol should be beneficial in this condition, causing an increased flow of lymph away from the udder and preventing udder caking. Usually five to ten milligrams daily by mouth are used for this purpose in women so that possibly 30 to 50 mg. put into a salve and massaged on the udder would be adequate in cows.

There are a number of reports that the use of estrogens is beneficial in the treatment of some cases of sterility of livestock. Stilbestrol being a very active estrogen and also cheap has considerable promise in this condition. The experimental evidence is still insufficient to say just how useful stilbestrol will prove to be for correction of sterility. The U. S. D. A. research center at Beltsville, Maryland, is now setting up a project to study this problem.

Another possibility for the use of stilbestrol in dairy animals is after abortion in the last half of pregnancy. The milk secreting glands are prepared for the next lactation by the sixth month of pregnancy. During the last three months of pregnancy what occurs in heifer udders is mostly the beginning of secretion and a swelling of the udder with the accumulation of secretion. Then at calving there is a surge of milk secretion due to the action of estrogenic hormones on the lactogenic hormone of the pituitary gland. Production of lactogenic hormone increases greatly, is thrown into the blood and activates the udder milk secreting cells. In abortion this increase of lactogen secretion is missing because estrogen has not acted on the pituitary gland. If estrogen were supplied by the injection of stilbestrol, it should supply the missing link and cause a surge of milk secretion similar to that which occurs at normal calving.

As you can see, the possibilities for use of stilbestrol in dairy animals are great. It may be used in the near future to bring into milk production sterile cows which would otherwise be lost to the herd. Stilbestrol may prove

of great benefit in improving the condition of heifer udders at calving. It may prove useful in reducing the incidence of milk fever at calving, in overcoming some cases of sterility or in causing normal milk production from aborters. The experimental evidence for some of these possibilities is insufficient at this time to say that stilbestrol will definitely be useful in all of these conditions. The process of securing more evidence as to the usefulness of stilbestrol could be speeded up greatly and evidence rapidly accumulated if veterinarians and herdsmen were acquainted with the possibilities for the use of stilbestrol.

How Much Roughage for Sheep?

Condensed from The Kansas Farmer

LAMB feeders might as well make full use of home-grown roughages, because fattening lambs make most economical gains when their ration includes about 55 per cent of roughage feeds. This observation climaxes results of a practical feeding test conducted at the Garden City Experiment Station and announced there on Lamb Feeders' Day.

R. F. Cox, in charge of sheep investigations, pointed out that having a balanced ration calls for more than chemical balance between proteins, carbohydrates and fats. For most satisfactory gains there must also be "physical balance," which means simply a proper balance between concentrates and roughages in the daily ration.

"We must remember that sheep, like cows, are ruminant animals, with digestive systems geared to consumption of roughage feeds," Mr. Cox said. "We have known for some time that too much concentrated feed for lambs may upset the digestive system and increase cost of gains. Purpose of this experiment was to determine just how much concentrate should be included for most economical gains."

Cox explained that each lot of lambs in the test received a basic ration of milo grain, cottonseed meal, sumac stover, and ground limestone. Only difference in the lots was the ratio between con-

Reprinted by permission from the Kansas Farmer, Topeka, Kansas, April 4, 1942

centrates and roughage. As the amount of concentrates increased from 25, 35, and 45 per cent on up to 55 per cent, gains of the lambs increased. However, at 65 per cent concentrates, the gains dropped off sharply.

Lambs in the lot receiving 65 per cent concentrates did not stay on feed as well as the others. It was obvious they did not digest their feeds well or make efficient use of them. Lambs receiving 55 per cent concentrates made more rapid gains than those receiving 45 per cent, but those receiving only 45 per cent concentrates made more economical gains. Summarizing the results, Mr. Cox concluded the most desirable amount of concentrates lies within the range of 45 to 55 per cent, and that it is wasteful to feed lambs a ration containing as much as 65 per cent concentrates.

The Kansas lamb feeders were particularly interested in another test comparing the value of different roughage feeds. Sumac stover proved superior to Finney milo, for rate and economy of gains. In this particular test, alfalfa straw proved equal in value to alfalfa hay. However, in previous tests alfalfa straw has not compared quite so favorably with hay. Both alfalfa hay and alfalfa straw produced more rapid gains than either sumac stover or Finney milo stover.

National defense requirements of lumber and timber products during the next 12 months are expected to be in excess of 4,000,000,000 feet.

—*Southern Agriculturist*

Plant Analyses as An Aid to Diagnosing Nutrient Deficiencies

Condensed from Pacific Rural Press

Dr. Albert Ulrich
University of California

RECENTLY agricultural workers have been seeking the answer to the fertilizer requirements of plants from the plant itself, and in some cases they have been quite successful. It is relatively simple to carry out the chemical analyses of the plant material collected at regular intervals throughout the growing season, and with enough experience the results can be applied practically. In this review some of the requirements of conducting plant analyses will be stated so that the reader may understand the basis of the new technique.

The two procedures used in analysing plans are fundamentally the same except as to speed and accuracy. The appropriate plant sample may be taken to the laboratory and there carefully analysed for nitrogen, phosphorus, potassium, etc., or the same determinations may be made by the layman more quickly, but much less accurately out in the field or in the kitchen with a test kit. At present these kits are not recommended for general use unless the individual is willing to compare the readings obtained from deficient plants with the readings from plants which have responded to fertilizer applications.

The reason for making plant tests or analyses is based primarily upon the assumption that the concentration of a given mineral in a particular plant part reflects the success with which that plant has been able to obtain the substance from the soil in relation to its rate of growth. It is obvious that if the rate of growth of the plant is rapid it will require more of a given fertilizer constituent, as for example potassium, than if the rate of growth is slow. The ease with which the plant can obtain potassium will depend in part upon the amount available in the soil.

We know that plants will not grow readily without an adequate supply of nitrogen, phosphorus, potassium, and other nutrients. Whenever one of these is limiting, growth is retarded. In our potas-

Reprinted by permission from the Pacific Rural Press, March 21, 1942

sium example used above, plant growth is reduced greatly or stops whenever a deficiency of this element arises. By analysing the proper plant part for potassium, a low value for this mineral will be found, which by previous experiments has been disclosed as inadequate for good growth. Corresponding plants with potassium values above the minimum range should be adequately supplied with potassium at that particular moment. At a later date the balance between the potassium supply and demand may be altered so that the plants which were found to be deficient earlier become adequately supplied, while those which were adequately supplied may now be deficient. Therefore, a study of the trends which take place in the plants as the growing season progresses must be made in order to ascertain the adequacy of a particular nutrient in the plant. The longer a plant is deficient in a given mineral, the greater the likelihood that the quantity and/or quality of the crop will be reduced.

Not all parts of the plant will do for determining the mineral requirements of the plant. Of the few plants which have been studied carefully, it has been found that the leaf stalk (petiole) of the most recently matured leaf near the tip of the canes from grape vines reflects better the potassium and nitrogen (as nitrate) status of the plant than the broad portion of the leaf (blade). For Ladino clover the leaf petioles are also better for potassium, but for phosphorus, the leaf blades under some conditions may be better than the leaf petioles. In the case of sugar beets the nitrogen status of the plant may be determined easily by testing for nitrates in the petioles taken from the most recently "matured" leaves in the center of the plant and not its small center leaves or the old outer leaves. For tomato plants the petioles of leaves taken half-way down from the top of the plant may serve to indicate the potassium status of the plant better than leaves taken from the base or from the tip of the plant or by taking parts of the main stem for analysis. Other plants and plant nutrients will be investigated as time and facilities permit.

The data presented in tables 1-3 will illustrate some of the results which have been obtained with grapes and Ladino clover. These results indicate that whenever nitrogen, phosphorus or potassium becomes limiting, the addition of the required plant nutrient increases the yield. Thus, when the potassium in the leaf petioles of vines reaches a low value (0.50 per cent or less) in July or early August (table 1), the vines are very likely to respond to potassium applications.

TABLE ONE

Petite Sirah Grapes

Field Experiment in Alexander Valley (Sonoma County)

Treatment (1)	Per cent potassium in leaf petioles (1941)				1941 yields in tons per acre
	May 16	June 25	Aug. 13	Sept. 18	
Untreated	2.58	1.61	0.58	0.31	2.92
Potassium sulfate (2)	3.59	2.77	1.17	0.80	3.98

(1) All treatments were repeated three times.

(2) One pound of potassium sulfate per vine was applied in January of each of the following years 1935, 1936, 1937 and 1938. Thereafter no fertilizer was given to the vines.

TABLE TWO

Mataro Grapes

Field Experiment at Guasti (San Bernardino County)

Treatment (1)	Parts per million of nitrate-nitrogen in leaf petioles (1941)			1941 yields in tons per acre
	May 28	July 11	Sept. 20	
Untreated	87	81	14	2.53
Ammonium sulfate (2)	650	420	291	3.89

(1) All treatments were repeated six times.

(2) One pound of ammonium sulfate per vine was added in 1939, 1940 and 1941.

TABLE THREE

Ladino Clover Pot Experiments at Berkeley

Treatments (1)	Cutting Dates (1941)					
	Mar. 25	Apr. 30	Fertilizer Applied Here May 9th	June 2	July 8	Aug. 12	Sept. 16
				Yield in grams of dry weight per pot			
Phosphorus (no potassium)	29	21		33	34	23	18
Potassium (no phosphorus)	20	16		18	15	13	12
Phosphorus plus potassium	31	21		36	52	32	26
				Parts per million of soluble phosphorus			
Phosphorus (no potassium)	633	439		1736	1589	1377	1072
Potassium (no phosphorus)	595	366		326	399	338	367
Phosphorus plus potassium	534	398		1182	901	645	562
				Per cent potassium			
Phosphorus (no potassium)	1.37	0.98		0.79	0.70	0.56	0.44
Potassium (no phosphorus)	3.40	2.44		3.12	3.14	2.82	2.74
Phosphorus plus potassium	1.79	1.23		3.78	2.14	1.21	0.81

(1) All treatments were repeated six times.

Vines with nitrate-nitrogen values as low as those recorded in table 2 are apt to respond to nitrogen applications, especially if these low values occur early in the season and when all other growing conditions are favorable. The data for Ladino clover presented in table 3 illustrate the influence of potassium and phosphorous applications on yields and on the soluble phosphorus and potassium content of the leaf petioles. When plants are deficient in potassium, as in the no potassium treatment, the potassium values are low, while the phosphate values are high throughout the growing season. The opposite condition prevails when potassium is added without phosphorous. The potassium values become high while the phosphorus values are low. When both phosphorus and potassium are added, the Ladino clover makes better growth as shown by the higher yields for each cutting. As the season progresses, the potassium and phosphorus values decrease until the low values obtained in September indicate that larger quantities of these fertilizers should have been applied in the spring or additional amounts added later in the season. The latter procedure may be preferable since the nutrient level in the plants would not fluctuate as much when the fertilizers are added all at one time.

A flood control and an irrigation system were begun in the Nile Valley in 3400 B.C. The dam impounded a water area of 700 square miles.

—*Southern Agriculturist*

Which Forage Crops?

Condensed from New England Homestead

J. S. Owens

WHAT shall I grow? This question every farmer asks himself many times during the year.

The choice of crops is important. The ambition of every dairy farmer is to raise all of the high quality forage he can use. This is a matter of economy. How much high quality hay, pasture and corn silage can be used and which crops will produce the highest yields and the highest quality of feed?

For more than a half century a host of crops have been compared in a variety of ways at the Connecticut Experiment Station at Storrs. New ones have been introduced from time to time and either forgotten because of inferior value or, when promising, grown for years to learn more about them. A comparison of yields for the choice ones is given below. These yields are those which have been secured with good, ordinary treatments, not excessive fertilization or unusual care, probably not even equal to that given by many farmers.

The differences in yields of feed given in the table below are considerable and immensely interesting. Corn easily leads the list in digestible nutrients produced per acre. This fact seems to explain why farmers are so reluctant to abandon this valuable crop. With limited acreage for feed crops, corn can assist greatly in getting enough feed for the winter. Note, too, that digestibility is high, about 65 percent on a dry matter basis.

Alfalfa clearly leads as a protein producer and also ranks first in total digestible nutrients among the crops which do not require seeding each year. Timothy, even though fertilized with nitrogen, made a very poor second among the perennial hay crops. Clover did much better as a source of protein but did not equal timothy in producing carbohydrates.

Japanese millet and soybeans can be compared in much the same way as timothy and clover. Both yielded well, the soybeans being surpassed only by alfalfa in growing protein and the millet was exceeded only by corn in yield of carbohydrates. It is unfortunate that such excellent crops are annuals—only one crop to repay the costs of preparation and seeding.

The last two on the list given

Reprinted by permission from New England Homestead, Springfield, Mass., April 4, 1942

have been measured as pasture crops. As may be expected with leafy, immature grasses and trailing perennial clovers, the protein content and digestibility of all the nutrients are exceedingly high. The yields, too, are as high as several of the crops cut as hay and to which harvesting and other costs must be added. The permanent pasture yields are taken from the large plots at Storrs which have been fertilized and grazed for eighteen years but never reseeded. The treatment has been only limestone and superphosphate, a cost of only $1.50 per acre per year for materials and a yield of 1820 pounds of total digestible nutrients. It seems very safe to conclude that this really tops the entire list in producing feed at a low cost.

Yields and even feed quality are not the only factors, you will say, to consider in planning a cropping program and that is right. Alfalfa is most dependable on well drained soils and permanent pasture does best on "wet" soils. Soybeans are difficult to cure in late August or September, but they can be put into the silo along with the corn. A larger investment in seed, fertilizer and lime is needed for some crops than for others and so on. However, with yield data such as those given, experiences of your own and those of your neighbors, crop selection and planning can be adapted to the farm to effect larger yields, better quality, lower costs and fewer failures.

The greatly increased demand for more feed makes the need for re-examining the cropping system imperative. More feed will be needed, fertilizer, labor and machinery may be insufficient. Even the supplies of grain feeds might become uncertain. Good hay, pasture and silage will have more value than they have had for a long time.

To choose from among the several long-time possibilities for crop improvement is not unlike debating which leg to remove from a three-legged stool. There is, of course, little to do but start from the present situation and improve a portion each year. If long-time improvement can be combined with increased production this year, the gain is twofold and the practice is worthy of serious consideration. This is true, for instance, when seeding alfalfa, clovers and grasses in rye in early spring. The rye can be pastured in late April and throughout May and then a crop of hay or pasture removed in late summer.

When oats, sown as a companion crop with seedings, are pastured, there is a good chance of a medium-sized crop of clover or alfalfa in late summer. If the seeding is Ladino clover and orchard grass, the pasturing can

continue at intervals from early in June until late fall. Pasturing oats has come into great favor in Connecticut the past few years. The seedings are usually better than when the oats are cut for hay or grain, the pasturing starts just at the time the permanent pastures need a vacation and then stays good through much of the hot weather. Oats as pasture contains about 30 percent digestible proteins (dry basis) and oats as hay, only 5.1 percent, according to Morrison's tables; another weighty explanation for the popularity of oat pasture.

There are other crops which "fill in" here and there. Millet will produce large yields for either pasture, hay or silage. The Japanese variety has consistently outyielded all others by a wide margin at Storrs. Soybeans have also produced a lot of high quality feed and they may be sown even after cutting an early crop of hay and be ready to mix into the silo with the corn in September. Another excellent plan is to sow a bushel (per acre) of soybeans with ten pounds of Japanese millet.

The foregoing has been given to suggest a manner of sizing up the feed crop raising possibilities. There are other good crops and other ways in which they may fit into an efficient crop growing system.

Planning will help in filling in the gaps and in insuring an ample harvest.

YIELDS OF FORAGE CROPS
At Storrs Experiment Station

	Pounds per Acre		
	Dry Matter*	Protein*	Total Digestible Nutrients†
Alfalfa—First cutting	3400	620	1800
Second cutting	2100	460	1161
Total	5500	1080	3041
Clover—Two crops	3300	430	1890
Timothy	2900	175	1690
Millet—Japanese	6000	360	3280
Soybeans	4300	800	2370
Oats	2900	270	1530
Corn	7400	550	4900
Orchard grass—Ladino clover (cut four times)	3700	740	2400
Permanent Pasture	2800	672	1820

These yields represent the averages which have been secured over a period of years with good culture and moderate fertilization suited to the particular crops. They are not as large as some Connecticut farmers are securing but do represent a fair comparison of relative amounts of feed which may be expected from each.

*From actual weights and analyses. Add 10 percent to Dry Matter to approximate barn dry hay; multiply by 4 to approximate green weight.

†Calculated from standards given in Morrison's "Feeds and Feeding" (twentieth edition).

Vitamin C — For Sterility in Farm Animals

Condensed from Holstein-Friesian World

Paul H. Phillips

BARRENNESS in farm livestock is a baffling problem and a source of considerable loss to dairy and other livestock farmers. It is well known that bacterial infections and certain glandular disturbances cause failures in reproduction. We know, too, that proper nutrition is needed for animals to reproduce efficiently. This means, among other things, that the proper minerals and vitamins must be supplied if our farm animals are to grow, be healthy, and reproduce normally.

Recent experiments at the University of Wisconsin have focused attention upon the role played by ascorbic acid, or vitamin C, in the reproductive process. Until recently ascorbic acid was thought to be valuable only in the prevention of scurvy in man, monkey, and the guinea pig. All other species were thought to be able to get along without it as they make their own ascorbic acid.

Where and how the ascorbic acid is made in the body is not known. Experiments at the University of Wisconsin have shown that giving ascorbic acid for certain types of sterility brings about marked improvement in the reproductive abilities of some farm animals. This finding has been confirmed by the New York, Michigan, Ohio and other experiment stations. It has been shown to be effective in the slow breeding or sterile bull, the shy-breeding cows, the boar, the horse, and the jack.

The proof that vitamin C is useful in discouraging barrenness gives new importance to certain common feeds — notably green grass, green and first quality alfalfa hay, grass silage and other feeds high in carotene.

These feeds are important because they furnish the raw material carotene, from which cattle get their vitamin A. When the vitamin A supply is plentiful in the cow or bull, they are able to make vitamin C faster than when the vitamin A supply is low. Thus adequate carotene in the ration tends to increase the production of vitamin C. Vitamin A can be furnished directly for cows that have difficulty in converting carotene to vitamin A by feeding one teaspoonful of good grade shark liver oil daily.

Ascorbic acid is easily de-

Reprinted by permission from Holstein-Friesian World, Laconia, N. Y., March 28, 1942

stroyed. It is attacked by the oxygen of the air and by sunlight, so care must be used to prevent undue exposure to light or air, especially after the vitamin is made up in solution. In the form of crystals or powder it is relatively stable if kept tightly stoppered in colored bottles.

It can be given by mouth to the single stomached animal, like hogs and horses, but it has to be injected underneath the skin to be effective in those with a paunch such as cattle and sheep. The reason for this, as shown by experiments at the Pennsylvania Experiment Station, is that certain bacteria of the paunch destroy the vitamin in a very short while. At the University of Wisconsin attempts to rejuvenate sterile bulls by feeding ascorbic acid were unsuccessful while injections under the skin were effective in nine out of every ten cases.

A few drugs which ordinarily are used as anesthetics can be fed by mouth and cause an increase in the ascorbic acid content of the body. Chlorotone is one such drug which has been successfully used by the Michigan Experiment Station. However, the use of such drugs is somewhat dangerous for it may cause paralysis or even death if used in too large amounts. The use of such drugs therefore, should be left to the discretion of a veterinarian or used only under his supervision.

The dose of ascorbic acid necessary to bring about a response is roughly two grams (about three-quarters of a level teaspoonful) per animal given twice per week. It requires at least one gram per 1,000 pounds of live weight and results are somewhat better at double that dose. While larger doses are not harmful they are not necessary and do add to the cost of the treatment.

The action of ascorbic acid in the bulls seems to be the stimulation of the production of active sperm. It also results in an increase in sexual activity of the bull, and in the cow a favorable reaction necessary for the early stages of pregnancy. From data now available, it appears that ascorbic acid acts in some way to stimulate or "pep up" the activity of the glands involved in reproduction. Two kinds of sterility in bulls have responded to ascor-

	BULLS			
TYPE OF CASE	No. Treated	Percent Returned to Service	No. Treated 2nd Time	Percent Returned to Service
Mature heavily used bulls	28	97	8	80
Young developing bulls	13	100	1	100

bic acid treatment: mature heavily used bulls and young developing bulls just entering service.

While many other cases could be cited if the records were available, a summary of a portion of the data collected at the Wisconsin Station is given.

In the cow the types of cases which respond to ascorbic acid treatment divide themselves into two main groups: (1) cows which come into heat regularly but fail to settle on repeated breeding; and (2) those which breed and apparently settle but come back into heat on the 41st-43rd or 61st-64th days. A portion of the data on such cases is here summarized:

Defects in anatomy or the onset of old age cannot be corrected by the ascorbic acid treatment. Neither do the cystic ovary cases, nor irregular heat periods in the cow, respond to ascorbic acid. It has been claimed that ascorbic acid will induce heat periods in the cow which has failed to come into heat. Proof is still too scarce to justify the claim.

Ascorbic acid has been most frequently used in the crystalline form. It can be obtained from the veterinary supply houses through practicing veterinarians. If unable to get it locally write to your experiment station. It can be used directly as prescribed:

The crystalline ascorbic acid is dissolved in 0.9% salt solution, plain water, or a buffered solution composed of the contents of one capsule of buffer salts dissolved in 50 cubic centimeters of distilled water. Regardless of the type of solvent used it should be freshly boiled. The method used at the University of Wisconsin is:

Dissolve two grams (¾ of a level teaspoonful) of crystalline ascorbic acid in 10 cc. (2 teaspoonfuls) freshly boiled buffer solution, water, or 0.9% salt solution. Use the dissolved ascorbic acid immediately. Do not store.

For bulls inject the freshly dissolved ascorbic acid solution underneath the skin in the region of the shoulder and neck twice per week and continue the injections for three to six weeks or until improvement occurs.

COWS

	No. Cases	Average No. Times Bred	No. Settled After Treatment
Regular heats, and not settled	53	5	51
Breeds, then skips 1, 2 or 3 heats	23	6	19
Cystic ovaries and flabby uterus	8	many	0

For cows inject two grams underneath the skin on the day of breeding. Continue the injections twice a week for three weeks after breeding.

Examination of the blood of some cows has shown that the vitamin C content rises sharply during the heat period while others fail to show this reaction. Many of the shy breeding cows do not develop this rise in blood vitamin C. Injections into the vein on the day of heat have been used to "spike up" the vitamin C of such cows. More than 25 cases have been treated with good results.

In these cases, on the day of heat and just before breeding, two grams of ascorbic acid were given underneath the skin and two grams in the jugular vein. The cow was then bred immediately. This type of treatment has been successful in 60 to 65% of the cases of cows which have been bred repeatedly and failed to settle. Frequently, where the doses given only on the day of breeding failed, follow-up injections under the skin, given twice a week for three weeks after breeding, have been successful. Therefore, it seems that better results can be obtained, under average conditions, with treatments on the day of breeding and continued for two or three weeks following.

The movie industry uses about 500,000 pounds of camphor a year in making films. Twenty years ago camphor was a foreign monopoly, but now it is being made from pinene, derived from turpentine from Southern pines.

—*Southern Agriculturist*

Made-at-Home Device Saves Baling Wire

Condensed from Agricultural News Service

J. SLOAT WELLES has perfected, with characteristic Yankee ingenuity, a home-made wire-straightener that will enable farmers to reuse old bale ties, thereby protecting themselves from a possible wire shortage.

Farmers will need between 90,000 and 100,000 tons of 14 and 15-gauge wire for baling hay, straw and other forage crops in 1942, according to the Department of Agriculture. This is equivalent in weight to about three modern battleships or 3,000 medium tanks, and Washington officials have warned that war needs for iron may "severely restrict" production of bale ties.

Mr. Welles' wire straightener has been fashioned after a much more elaborate device made at Cornell University. Primarily, it consists of a 14-foot board, 2 by 10 inches, one end of which is notched to fit against the jaws of a bench vise, the other resting upon a saw horse for convenience. A tear-shaped piece of board is clamped to the board as far from the vise as the length of a normal piece of baling wire.

Clamped on, the board is adjustable for any length of wire. A stout piece of two by four smoothed at one end to handle more easily is used as a lever against the tear-shaped fulcrum. The hook for holding the wire end against the handle is a piece of strap iron from an old stanchion, but might be fashioned from any similar material. One end of this strap iron is bent around three sides of the wood handle. The other is tapered off and bent upward to hook through the round loop of the baling wire. The other end of the wire is fastened in the vise jaws. The straightening operation is merely one of stretching the wire about one inch, this being sufficient to remove all kinks and bends.

Experimentally, a wire was pulled more than fourteen inches before it broke, indicating that it could be repeatedly straightened for as many years' use. The break occurred near the center. The twisted ends showed only slight tendency to untwist during the pulling tension. Mr. Welles states that he and his hired man can straighten fifty ties in 15 minutes. The straightened wires, when oiled and packed in bundles, looked exactly like the new product from a service store.

Better Quality Eggs for Defense

Condensed from Everybodys Poultry Magazine

Carl O. Dossin

MORE than 5 per cent of the eggs laid are wasted because of improper handling somewhere between the hen and the housewife.

The following practices have been emphasized as being important in the production of quality eggs:

1. Keep birds confined.
2. Maintain a temperature of 65° in the egg cellar.
3. Maintain a relative humidity of 75 per cent in the egg cellar.
4. Pre-cool egg cases.
5. Gather eggs at least three times daily.
6. Cool eggs quickly.
7. Pack eggs daily.
8. Market eggs twice a week.

In addition to the practices suggested, a sound poultry feeding and management program should be followed. Clean nesting material, clean dry litter, screened perches on the droppings board and narrow perches on feeders, nests, and drinking fountains are factors in the production of clean eggs. Feeding an adequate amount of shell-forming material and some source of vitamin D are essential to the production of eggs with sound shells. The males should be moved from the laying flock at the close of the breeding season.

To learn the effectiveness of the quality egg program, visits were made to 81 Pennsylvania farms consigning eggs to the egg auctions during the past year. It must be remembered that only 100 eggs in each case sold at the auction are inspected and a 10 per cent tolerance of eggs in the next lower grade is permitted. When gathering the information used in this summary, the percentage of fancies was taken for the two sales previous to the time of the visit, for it was felt that this would give a better picture of the results obtained under the conditions which existed at the time of the visit.

The following summary shows that each step in the program is important and production of a high percentage of fancies is dependent upon following the entire program. It is clearly illustrated that the more practices you neglect, the lower your eggs will grade.

Gathering eggs three times daily would be emphasized as

Reprinted by permission from Everybody's Poultry Magazine, Hanover, Pa., April, 1942

most important. An egg is never better than when it is laid. Egg quality will decrease rapidly in the nest unless the eggs are gathered frequently in warm weather. Many more fancies were found where this was done, but it is a worthwhile practice from the standpoint of reducing the number of soiled and broken eggs alone.

To maintain a temperature below 65° in the egg room during the summer usually requires that the cellar be constructed as much as possible below ground, with either a building or heavy coating of earth over it.

A temperature under 45° is too low because of the difficulty in maintaining satisfactory humidity. Eggs held at too low temperatures will sweat when brought into a warmer atmosphere.

A relative humidity in the egg room of 75 per cent is important if the eggs are to look right under the candle. Observations on Pennsylvania farms indicate that if the correct temperature is maintained and the entire program followed, there is no need of having extremely high humidity. Those farms maintaining a temperature between 50 and 60° in their egg rooms made a high percentage of fancies even though the relative humidity approximated 70 per cent.

Whenever relatively high humidity is maintained, the danger from molds is increased. Observations in the field indicate that the mold problem is more acute where earth floors are used in the egg rooms than when concrete, stone, or brick floors are used. The indications are that the use of a small house fan to circulate the air in the egg room will help to eliminate the mold problem. The fan will also help to remove the animal heat from the eggs.

In the summer when it may be cooler outside than it is inside, the window in the egg room should be open. The lowest possible temperature that can be obtained in the summer will help to eliminate this problem.

The care of empty egg cases is a definite factor in preventing the mold problem. Only a one to two day supply of empty cases should be held in the egg room before they are used. The main supply of empty cases should be held in a clean dry room.

Studies conducted at the University of Missouri bring out that eggs can be cooled quickly by using wire baskets for gathering and having a small house fan circulating the air in the egg room. Removing the animal heat quickly from the eggs is an important factor in egg quality. Eggs that are packed while still warm lose quality quickly.

It was interesting to note that those who packed their eggs only twice a week made a low percent-

age of fancies even though they followed the rest of the program. If they packed their eggs daily after the animal heat was removed, or every other day, and followed the rest of the program, most of their eggs made the fancy grade.

A dry egg case is a thief. It will absorb approximately a pound of moisture. Unless the empty cases are put into the egg room with low temperature and high humidity for a day or two in advance of the time they are used for packing eggs, it is almost impossible to make a high percentage of fancies even though the rest of the program is followed.

Those poultrymen who were marketing once a week realized that they had to take better care of their eggs if they wanted to make the fancy grade while the others in many instances become careless of their egg care because they felt marketing twice a week would offset neglect of other practices in the program. All poultrymen should be encouraged to market eggs as soon as possible after they are laid. They should, however, follow the other practices in the program.

Experimental work has shown that green feed will affect the color of the egg yolk. Egg buyers insist that eggs, when candled, have a dimly visible yolk shadow. Dark yolks usually have a darker yolk shadow when candled. Keeping the birds confined will also reduce the number of soiled eggs.

	No. of Farms	Per Cent Fancy
Followed all practices	4	98.75
Neglected 1 practice	16	95.4
Neglected 2 practices	28	52.3
Neglected 3 practices	16	39.4
Neglected 4 practices	12	19.0
Neglected 5 practices	5	4.0

Fence Row Facts

Consensed from Soil Conservation

Charles A. Dambach
Soil Conservation Service

FENCE rows can't be farmed, but they can be managed for the benefit of adjacent crops. Each 2 miles of clean fence row amounts to an acre of wasted land that could be used to improve biologic conditions on farmland. Simple ways to make these thin strips of land useful in agriculture form the substance of this article.

In Indiana and Ohio there are approximately 750 rods of owned fences for each 100-acre farm. The average width of clean fence rows is about 4 feet; brushy fence rows and Osage orange hedges vary in width from 4 to 20 feet. If all fence rows on a farm are clean they occupy approximately one percent of the land; if all are brushy they occupy from two to four percent. Two miles of clean fence row equal an acre of land; a brushy fence row occupies from one and a half to four times this acreage.

Some farmers take pride in keeping their fence rows clean, the same sort of pride others have taken in straight furrows—even though they be up and down hill. Plowing with the property fence lines instead of with the land, has caused a considerable amount of erosion. Fence rows on the contour, permanently vegetated, become erosion buffer strips and contour guide lines that aid in retarding erosion; and to appear neat, a fence need not be bare of vegetation. Fence rows of bluegrass sod or of low shrubs add much to the attractiveness of a farmstead. They also can be used to produce low-growing fruits and nuts such as blackberry, plum, cherry, hazel, and grape, and decorative plants as bittersweet, winterberry and Christmas trees.

In the agricultural sections of Ohio and Indiana, the amount and distribution of fence-row vegetation probably affects farm wildlife more than any other factor. There are many more birds on farms with woody fence rows than on similar farms lacking such cover. In Ohio, it was found that there were 32 times as many songbirds in shrubbery fence rows as in open crop fields. Even clean fence rows of blue-

Condensed from Soil Conservation, Washington, D. C., April, 1942

grass supported nearly 7 times as many birds as open cropland.

Few of the insects found in fence rows are crop pests; most of them are harmless; and about a third are beneficial. For example, in Ohio there were 60 times as many aphid-eating lady beetles in Osage orange hedges and shrubbery fence rows as in blue grass cover. On many farms, permanent fence rows are the only places where beneficial insects, such as lady beetles, assassin bugs, and damsel bugs, can live undisturbed from year to year. The recommendations of entomologists to clean up fence rows as an insect control measure have been grossly misunderstood. Such control for specific pests is sometimes necessary, but not in all fence rows in all farming districts.

Mice abound in woody fence rows, but, fortunately, they usually are not the kinds that attack crops. Although meadow mice are abundant in heavily sodded grass borders, they do not find woody cover to their liking. However, woody cover provides homes for predators, as shrikes, sparrow hawks, skunks, and weasels that feed on rodents generally. Beneficial small mammals, like the short-tailed shrew and least shrew, live in fence rows as well as in crop fields.

Most of our common crop weeds are annual or biennial plants, but the perennial plants of permanent Ohio fence rows are not weed species. Annual and biennial plants stand little chance of becoming established under the shade of shrubs and trees or in fence rows of vigorous plants such as bluegrass.

Burning fence rows to control weeds, insects, or rodents usually fails to accomplish its purpose. By the time weeds are dry enough to burn, their seed have ripened and scattered, and their roots are too deep to be harmed. Few injurious insects are destroyed by burning and most entomologists have discontinued recommending this practice except for special purposes. Rodents in fence rows can easily escape from fires by remaining in underground runways or by moving into adjacent fields. Burning may do much harm; even a grass fire may be hot enough to melt the protective zinc coating on fence wire and metal posts, and to set fire to wooden posts. Fires also destroy beneficial insects and homes for insectivorous birds.

Fence rows are a necessary part of the farm pattern, but too often this part, small as it is, has been badly misused. Like every other acre, fence row acres should be put to their best use. We need to cast off old ideas about the fence row and manage it purposefully as as important element of the farm.

Planning the Use of Pasture

Condensed from Eastern States Cooperator

Clarence H. Parsons
Massachusetts State College

THE first Sunday in May is "turning out day" has been the rule of many farmers. Cattle have been turned on pasture on that date with very little regard to the season or whether there was an adequate amount of grass available. It has been the custom to turn out the young stock to a back pasture in early May and except for an occasional salting they often have been forgotten until fall. Pasture was just taken for granted.

In contrast, the modern slogan is: "Pasture is a crop." This idea appears repeatedly wherever pasture management problems are discussed. And what does this slogan imply? First, the financially profitable crop is a subject for its owner to study. For instance, "cash crop" growers give careful consideration to seed, fertilizer and cultural practices. Pasture unquestionably provides the cheapest feed for dairy cattle during the early summer months. A crop that makes a significant saving on the grain and labor bills for dairymen during May, June and possibly longer deserves just as much thought and planning before the season starts as does, for instance, a crop of potatoes.

When cattle are first turned out in the spring they invariably shrink in weight. This loss in the animals' live weight occurs quickly, but the rebuilding of this condition is a slower process. Some years ago heifers at Massachusetts State College farm were weighed at the start of the pasture season and periodically thereafter. A loss of 25 to 35 pounds on yearling and two-year-old heifers was not uncommon.

Anything that may be done to reduce this shrinkage we feel is important. Accordingly, we turn our stock out on a nearby pasture for only an hour or two the first day and continue barn feeding. The second day the cattle are out for about half a day and then all day on the third day. The animals are brought in at night, even after the third day, and fed hay again. Young stock are then turned out to a back pasture without further barn feeding. This plan makes the change from barn feeding to rich,

Reprinted by permission from Eastern States Cooperator, Springfield, Mass., April, 1942

new, high protein grass more gradual than the old system of turning out from the barn to a distant pasture abruptly.

The gradual change causes less of a digestive upset, somewhat less diarrhea and less shrinkage of body weight. A further advantage of this plan with young stock is that they may be driven to a distant pasture much more easily. You know the enthusiasm with which young stock greet the great outdoors the first day out of the barn. If they can get most of the running out of their systems in a nearby pasture the first day or two, they may then be driven to a more distant pasture with much less effort.

Pasture grasses and clovers do, of course, grow luxuriantly during May and June and then produce much less growth in July and August. Yet how few men use this knowledge! It is obvious that a pasture area which will care for a certain number of stock during May and June will not be adequate during August. Many, many cattle have excellent grazing in these early months and are in splendid condition by early July. Then their feed becomes less abundant, but the owner is busy harvesting his hay crop and doesn't have time to pay much attention to the heifers which seem to be taking care of themselves. By late August, the stock are sure to be much thinner than they were six weeks earlier. Then this lost flesh may be put back on the animals only by expensive barn feeding. Why not plan now to take out from these pastures enough stock in late July so that the remainder may have sufficient feed to stay in good condition throughout the season and come back to the barn in the fall showing uniformly good gains?

Our back pasture will carry 70 head during June. Usually early in July, the feed is no longer sufficient to continue their growth and 20 to 25 head are brought back to the home pastures. Again in early or middle August another 20 head are taken off in order that the remaining 25 or 30 may have growth-making feed throughout the fall.

What do we do with the heifers taken off? We turn the cows on some of the hay fields which were cut early and turn over some of the permanent pasture used earlier by the cows to these heifers brought home in the middle of the season.

Rotational grazing has grown in favor during recent years and it has numerous advantages. Just keeping stock off a field for two or three weeks will increase the total growth of forage. If fields are grazed in rotation, cattle can secure better quality feed quicker and thereby reduce the amount of purchased grain needed to bal-

ance the pasture. Rotational grazing, however, does require more careful management than continuous grazing. Anyone can turn cows out to the same field every day of the summer. But to have the cows graze four or five fields in turn requires daily decisions as to whether or not there is enough feed left for another day on the last field grazed or if it is time to change to the next.

Last year the manager of a large herd of cows inaugurated a pasture system with six fields. He said he had wonderful feed and the cows milked heavily with a minimum of grain, but he also reported a lot of trouble with the production fluctuating up and down. Upon questioning, I found that his production jumped up each time the herd was turned on a fresh field and that the milk flow was much lower the last day that a field was grazed. This is the usual result unless some means is used to balance the luxuriance of the pasture. When cows are turned on grass and clover five or six inches high, it is only natural that they produce more milk than when the grass has been eaten to an inch or two in height. No dairyman wants his milk flow to vary constantly and therefore this situation must be corrected.

There are two simple ways of leveling the day-by-day production. One is to divide the herd into two groups; then let the heavy producing cows have first chance at each field and as soon as grass becomes short turn in the dry cows and young stock. Another plan which does not require two groups of cattle is more feasible on many farms. This plan is simply to provide excellent feed for night pasture and only fair feed for day pasture or vice versa. In other words, as soon as feed begins to be short on one field, turn the milking herd onto a fresh field for the night pasture, but return them to the first field during the day for another time or two. In this way whenever the herd is finishing off a field, in the same 24 hours the cows have a chance at some fresh pasture.

Rotational grazing does require watching and planning on the part of the herd manager, but it provides infinitely better quality of roughage than does continuous grazing. I know of few greater satisfactions than to see a herd of cows lying down in a field of five-inch grass and clover and chewing their cuds in less than two hours from turning out time. One pound of grain for seven pounds of milk is our rule under these conditions. And that's all right!

Dried Eggs

Condensed from Poultry Tribune

J. W. Kinghorne
U. S. Dept. of Agriculture

SINCE the time Napoleon recognized the great value of food in warfare and reduced his views to the homely statement, "an army travels on its stomach," foods generally have become increasingly important in military operations.

As World War No. 1 caused the development of the production of powdered or dry milk products, the present world conflict may be accredited with the great increase that has taken place in the production of dried egg products. Strangely enough, the development of the dried egg industry was actually halted during the early days of the first World War, due to several factors. Egg prices, together with increases in other food products, rose rapidly due to war conditions. Then, too, governmental regulations as to quality were becoming operative, making it increasingly difficult for processors to utilize the cheaper and lower grades of eggs for this purpose and meet the required specifications. As the result of these influences, and the increasing competitive effect of imports of Chinese dried eggs, several of the larger American processors transferred their drying operations to China. In that country, eggs of passable quality could be purchased sufficiently cheap to dry, and, even with shipping costs to the United States and an import duty of 10 cents a pound, they could be marketed here profitably.

With the decline of the industry in this country, imports from China increased rapidly. From 1915-17, imports averaged approximately 6 million pounds a year. From 1917-20, the yearly average rose to 10 million pounds, and from 1920-22 to about 24 million pounds annually. During the latter part of 1922, the tariff on dried eggs was increased from the former rate of 10 cents per pound to 18 cents. This resulted in some decline in imports which was further influenced by the outbreak of the civil conflict in China several years later.

A revival of the industry in this country was noted in 1929 but production was relatively

Reprinted by permission from the Poultry Tribune, April, 1942

small. It was not until 1931, when the tariff was increased from 18 to 27 cents a pound and lower egg prices resulted from the first years of the depression, that definite expansion took place. Variations in domestic production and imports occurred from 1935 to '37, due principally to comparable fluctuations in domestic egg prices. With the Japanese invasion of China the exportation of dried egg products from that country declined rapidly and domestic production correspondingly increased. In 1939, which was the record year up to that time, domestic production reached slightly more than 10 million pounds.

With the advent of the Lend-Lease Act and the authority to purchase quantities of food products for shipment to Britain and other countries resisting aggression, eggs and egg products were included among the principal foods for this purpose. The reason, as every poultryman knows, was due to the highly nourishing qualities of these products, their universal acceptance, and wide variety of uses.

Shell eggs, frozen eggs and eggs in dried form were the products that the industry supplied as its contribution to help in the world-wide struggle against barbaric aggression. Later, canned chicken was included among the commodities purchased by the Surplus Marketing Administration for use in Britain.

As the program developed, dried eggs became increasingly important as one of the principal export products. Although quantities of shell eggs and frozen eggs were bought and shipped, both of these products required refrigeration while dried eggs do not, and refrigerator space on ships is at a premium. Then, too, both eggs in the shell and in frozen form are more bulky than the dried product and again shipping space generally has to be conserved.

A case of shell eggs weighing approximately 45 lbs. weighs about 10 lbs. when dried and represents the whole food value of the original eggs in the shell. Therefore, the practicability and economy of supplying eggs in this form is obvious.

At the beginning of this program there were about 16 egg drying plants in the United States, located principally in Texas, Oklahoma and Missouri. The normal operating season for drying is during the months of peak egg production, namely, from mid-March to mid-July. By increasing their operations to a full 20 to 22 hour day and operating on the basis of 300 working days, these plants could increase their output to approximately 45 to 50 million pounds. Such capacity, however, was found insuffi-

cient to meet the needs for export, the domestic demand, and for use of our armed forces. These combined needs, it was believed, would total approximately 114 million pounds annually.

Through the expansion of existing drying plants and priority allocations for new plants and equipment, adequate production capacity was developed through the past summer to meet these requirements. Since September 1, no further encouragement has been given by the Department of Agriculture for added expansion. Since that time, additional and excess dried egg production capacity has been brought about largely by milk driers who added the drying of eggs to their plant operations on a part time basis or are using their milk equipment entirely for dried egg production. It was estimated on November 1 that the full time egg drying capacity was approximately 167 million pounds annually.

The rapidity with which this industry has grown may be further realized when we compare the 16 plants that existed six months ago with approximately 60 that are now operating or are in the process of construction.

From March 15 through January 31, the Surplus Marketing Administration of the Department has bought more than 55,166,115 lbs. of dried eggs, primarily for Lend-Lease shipment. This golden yellow powder is packed in tongue and groove barrels lined with a double moisture resisting interliner and holding from 150 to 200 lbs. each.

While the growth of this industry has been phenomenal, it must be remembered that the present capacity is based on a full time yearly operation. These same plants operating on the normal pre-war basis of but 4 months a year and for fewer hours per day would reduce the total output substantially. The ability of this industry, based on its present physical status, to meet the return of normal conditions will depend on the development of new outlets and uses. The one big field, heretofore practically unexplored, but having definite possibilities is the American home. Unquestionably, a concerted effort on the part of the industry will be made, perhaps even before the present huge export outlet subsides, to popularize and broaden the market for this product. The extent of the success of such efforts will, we believe, be dependent on the industry producing a *quality product, reasonably priced,* and *readily available.*

Feeding Corn

Condensed from Missouri Ruralist

MAKING every acre yield every bushel possible this year is a contribution toward winning the war. And when we think of increasing the yields of corn, soybeans, or small grain we naturally think of fertilizers.

Use of fertilizers to increase yields is a highly-recommended practice. But even with the war calling for emphatic action, we should continue to use our fertilizers carefully, and with sound judgment.

To waste fertilizer by applying it on soils or crops where there will be no benefits would be much more serious than not to use fertilizer at all.

"Shall I fertilize my corn crop?" That is a question which has no universal answer. Fertilizer on corn doesn't always pay. You must decide whether you think it will pay to apply fertilizer to corn after considering several factors. Generally speaking, however, it is a good practice.

One of the best observers of fertilizing practices is G. E. Smith, of the department of soils at the University of Missouri. He combines the knowledge gained in the laboratory with that of practical experience in the fields, and is able to give us some good pointers on fertilizing corn. Mr. Smith points out some things we all know that account for some of the poor showings we have seen with fertilized corn.

When we stop to think about it we realize that very often the limiting factor on yields of corn is not the corn, the soil, or methods of growing—but rainfall. Unfortunately we have many crops of corn cut short by lack of rain just when we need it.

When such a situation arises, all the fertilizer in the world will not boost yields an ear—in fact it may even lower them.

In exactly the same sections in years of abundant rainfall, increases of from 10 to 25 bushels to the acre may result from using fertilizer.

Despite the growing trend to put corn only on our best ground, there still is much corn planted on soils that are pretty low on plant nutrients.

On such run-down soils preliminary soil-building practices are needed before fertilizer on corn will be effective. Legumes are needed as green-manure crops to add humus. And to get legumes, lime and phosphate are the best-possible soil conditioners.

But applications of fertilizer on

Reprinted by permission from the Missouri Ruralist, April 11, 1942

good soil are profitable. With the amazing ability that the new hybrid corns have to make high yields, the corn itself is no longer a limiting factor, as it once was. With a good season and a good hybrid corn the yield will depend on the fertility of the soil, and we know that adding fertilizer greatly steps up fertility.

Some figures quoted by Mr. Smith on experiments at Sanborn Field at the Missouri Experiment Station bear out his theories along this line. The figures are for the 1940 crop on a corn-wheat rotation. On untreated soil the corn yield was 29.5 bushels. On soil treated with 400 pounds of 0-10-10 fertilizer to the acre the yield was stepped up to 30.7 bushels—not a paying proposition. On soil where manure was applied a good increase was noted, 40 bushels.

Manure plus fertilizer was even more profitable, with a yield of 45 bushels. But by adding nitrogen from the cheapest source—sweet clover plowed under—a still greater boost was given to the corn—56 bushels.

But to prove the merits of complete management of the soil, the most profitable use of fertilizer came with using it on land in conjunction with a green-manure crop of sweet clover. Here the yield was stepped up to 66 bushels to the acre.

So would you say that spreading fertilizer on land that would make only 20 to 25 bushels of corn to the acre was helping to win the war? Isn't it much wiser to "allot" the supply of fertilizer to soils that have been handled wisely so that a really-important increase in yields will result?

Indiscriminate use of fertilizer on any and all corn land might reduce, rather than increase, food production. Fertilization is not a substitute for poor farming.

Fertilizer is best applied to corn with an attachment on the corn planter. This prevents any injury to the seed, which may result when fertilizer and seed are placed together. And this is a more economical way to use fertilizer, 100 to 125 pounds to the acre applied with an attachment on the planter is as effective as 300 pounds when spread with a grain drill.

"The kind of fertilizer to use on corn will vary considerably in different sections," says Mr. Smith. "Where no lime or legumes are being used and where no manure is being spread, a mixture of 4-12-4 or 4-16-4 is best, applied at the rate of 125 pounds to the acre. Where lime has been used and corn follows a legume, nitrogen can be left out. Where sweet clover is turned under, more potash in the mixture, such as an 0-10-10 sometimes is best."

Importance of Good Tractor Care

Condensed from Pennsylvania Farmer

R. U. Blasingame

NOW that manufacturers are going to get only about 56 percent of the materials they had in 1941 with which to make farm tractors, it behooves every owner to take good care of the equipment he now has. A program of maintenance is certainly in order.

Fuel is a good place to begin. As a rule, reliable dealers have good clean gas, kerosene, fuel oil, tractor fuel and oil. No matter how good and clean petroleum products are to begin with, their quality can be lowered if they are not stored in clean containers in a cool place. Dirt can be blown into oil, grease and fuel when the tractor is being serviced. We have all seen a corn cob or potato used to plug up the oil can spout. Well, dirt will grind out bearings and stop up the carburetor.

That sediment bowl catches water, but if it isn't emptied regularly its value is lost.

Every time five gallons of fuel are burned in the tractor engine as much air is required as will fill a 90-ton silo. If that air is laden with dust it will wear out the engine. Why not service the air cleaner as the instruction book outlines? Dust mixed with oil makes good grinding compound. Air cleaners should be serviced on an average of once a day and more often in dusty conditions.

Then there is the hose from the cleaner to the carburetor. If it isn't kept tight dust will enter the engine.

Dust may enter the engine through the breather cap if it isn't kept clean. In fact, the breather cap is a miniature air cleaner. It is usually cleaned by washing it in kerosene then dipping it in clean engine oil.

Oil supplies a film which prevents metal to metal contact, thereby reducing wear. There are three cardinal requirements for good lubrication: (1) Use oil from a good dealer, (2) keep it clean, and (3) change it as recommended by the tractor manufacturer. The lubricating system will do the rest.

Most tractor engines have an oil filter. This acts as a strainer, removing dirt, sludge and other foreign matter as the oil passes through it. As the oil is filtered the dirt collects and clogs up the filter, then it is by-passed around back into the engine. This is like having no oil filter at all.

Some filters have a replaceable element, others have to be removed and a new one installed. The instruction book tells about

Reprinted by permission from Pennsylvania Farmer, Pittsburgh, Pa., March 14, 1942

how and when to look after the oil filter.

Oil filters strain the oil but they will not prevent dilution of the oil. That is why every tractor manufacturer is so explicit about what viscosity of oil to use at different seasons of the year and when it should be changed.

Most of us have seen the airplane pilot running his engine for a time before taking off. There are two reasons for this: first, to allow the engine to warm up before throwing on the full power, and second, to be sure the plane will take to the air. Likewise, we should give our tractors a warm-up period at slow speed to lubricate it properly before throwing on the full power. A cold engine at full throttle tends to dilute the oil badly.

Some engineers say that about as much heat from the fuel a tractor burns goes for cooling as we keep for power. Anyway, rain water is best for any engine cooling system. Water containing lime or magnesium will make a deposit in the engine and radiator. I heard a reliable tractor service man say not long ago that a pound of washing soda put in a tractor cooling system and the engine run for about an hour then drained out will clean out a lot of scale. "Be sure," he said, "to flush out the radiator twice with fresh water after using the washing soda." Then there are radiator flushing compounds made for the purpose.

This same service man said that the outside of the radiator must be kept clean too. He spoke of tractors overheating due to leaves, dust, straw and dust from grinding feed gathering on the outside of tractor radiators, thus insulating them from the blast of air forced over them by the fan. An overheated engine "won't pull the hat off your head," so the saying goes, but it will use oil, fuel, your time and temper and get nothing done.

Carburetors are to be left alone except by qualified mechanics. If set too lean the engine will overheat, actually use more fuel and will lose power. A loose fan belt may also cause overheating.

Good ignition depends largely on a little timely service, such as: (1) cleaning and re-gapping the spark plugs as recommended by the instruction book. If the plugs are badly burned new ones will pay for themselves in a short time. (2) Then use the right plug for the right place. So-called "hot" type plugs must be used for heavy fuels. They have longer insulators to retain the heat and burn off the carbon. "Cold" type plugs are for burning gasoline. (3) It is a good idea to have the dealer inspect the magneto. Breaker points deserve inspection, cleaning and adjusting regularly. On some recent tests it has

been shown that about 10 per cent fuel can be saved by a tractor tune-up.

From time to time valves must be ground and the engine cleaned. Winter or other off seasons are good times for this job. Now and then pistons, rings, valves and cylinder sleeves must be renewed.

When these precautions are exercised engine life goes up and repair bills come down. So take care of the tractor engine and you'll be spending minutes to save dollars!

The Influence of Frequency of Milking on Milk Production

Condensed from Guernsey Breeders' Journal

L. M. Ludwick, Arless Spielman and W. E. Petersen
University of Minnesota

As a means of evaluating the influence of frequency of milking on total milk yield, production of the right and left halves of the udder were recorded separately. Thus one half can serve as a check on the other.

Five mature Guernsey cows were used in the experiment. The experimental milkings covered a period of five months. In order to establish a basis for comparing the production of the two halves, preliminary milkings of each half were conducted which covered a period of ten days. The mean production for each half was established and then the frequency of milking was increased from two to three times a day, alternating halves at two-week intervals.

By comparing the records of the halves for the respective frequencies of milking, it was found that three-time-a-day milking had considerable advantage over two-time-a-day milking. Although none of the cows were in heavy lactation, the increase due to one additional milking per day was as high as sixteen per cent.

It was also observed that the first half which was milked three times a day seemed to continue at a relatively higher level of production even after twice-a-day procedure was resumed.

This proposed method of using one half of the udder as a check on the other may be of value in experiments regarding milk production where it is desirable to eliminate environmental factors and individual differences.

Land Settlement

Condensed from The Reclamation Era

Dr. Carl C. Taylor

Bureau of Agricultural Economics, Department of Agriculture

THE history and evolution of American society has been, to a considerable extent, the history of new land settlement. From Jamestown and Plymouth in 1607 and 1620 to about 1910, the story was one of people moving constantly westward, each generation settling a new section of the continent.

When the first Federal census was taken, there were less than 4,000,000 white settlers in the United States. Probably one-half of them had come directly from foreign countries, and the great majority of them were not living in the areas in which they were born. Needless to say, all of them, their parents and grandparents, lived in new-land settlements. By 1790, no colony had been established farther inland than 400 miles, and what might be called the line of frontier settlement averaged only about 250 miles from the Atlantic coast line.

Shortly after the Government was founded, a march of population westward began which lasted for a full 100 years. Each generation found the frontier several hundred miles toward the West. Areas which themselves had been settled by migrants from farther east just a generation before, were supplying the new generation to settle areas west of them.

This movement can almost be visualized as a tide of population, each succeeding wave of which settled a whole new section of the continent. These waves rolled in about 30-year intervals, and thus each generation of Americans for more than 100 years was a generation of pioneers. Young families who settled western Pennsylvania, parts of Kentucky and Tennessee before 1820, saw their sons and daughters settle Ohio, Indiana, Illinois, Alabama, Mississippi, and Arkansas between 1820 and 1850. They saw their grandsons and granddaughters settle Iowa, Minnesota, and Wisconsin between 1850 and 1870. By 1870, the westward march had reached the semi-arid regions of the Great Plains, had jumped these plains and begun settlement of the Pacific coast. Between 1870 and 1910, all of the intervening spaces had been occupied to some extent and the greatest era of new-land settlement ever to occur in the world, and the greatest area of new land ever to be oc-

Reprinted from The Reclamation Era, Washington, D. C., February, 1942

cupied in an equal length of time, had marked the era.

Population movements have continued since 1910. Many of them are still into new-land areas, but some of them are movements out of areas whose natural resources could not support all the people who attempted to occupy their lands. Three States—Nevada, Vermont, and Mississippi—lost population between 1910 and 1920. Thirty-three States and the District of Columbia gained 10 percent or more in population during that decade. Between 1920 and 1930, a State that had been settled as late as Montana lost population. Furthermore, increases in population took place in only 30 other States and the District of Columbia to the extent of 10 percent or more. Everyone is acquainted with the fact that 6 States—the 5 Great Plains States and Vermont — lost population between 1930 and 1940. Not so many people are aware of the fact that only 17 States and the District of Columbia increased their population as much as 10 percent or more during this decade. Our population increases and our population movements are slowing down.

For some time in the future, however, we shall continue to be a mobile people, our migrants still seeking out potential areas for settlement and still withdrawing from areas which were unwisely settled in earlier decades. Some of the areas from which they will withdraw are areas into which so large a number of people should not have gone during the period of pioneering; others will be areas in which original settlement was thoroughly justified, but in which the natural resources have been so diminished that they will no longer support the population now residing there.

All agencies and persons concerned with the destinies of new migrants are aware of the fact that unguided migration into, and unwise settlement of, areas with relatively poor natural resources have been exceedingly costly economically and even more costly socially. Such places have developed into problem areas that require heavy relief expenditures, and in which the whole level of life is thrown in jeopardy.

We have at least five large areas in the United States which can justifiably be described as problem areas. The Appalachian-Ozark Highlands, the Lake States Cut-over area, the Great Plains, the eastern Cotton Belt, and the Spanish - American - Indian areas of New Mexico and Arizona are all areas in which the natural resources are not adequate to support the population now living there. These are not areas which should be completely abandoned,

but either because the natural resources have diminished or because the population increases have been great, a population pressure upon the natural resources has resulted which has jeopardized the standard of living of the people.

An analysis of natural population trends, coupled with an analysis of relative, potential opportunities among the various geographic areas of the Nation, should guide future settlement policies and projects. I have already listed the broad deficit areas. There are, however, some surplus areas which in their natural development will accommodate more people than they are now supporting. Again, in very broad terms, I would name four such areas—Pacific Northwest, Mississippi Delta, Piedmont, and certain sections of Florida.

The Pacific Northwest is potential because of its irrigation possibilities. The Mississippi Delta is potential because of its drainage possibilities and certain sections of Florida are potential for the same reason. The Piedmont is a rapidly industrializing area, which means that urban population will increase and agriculture will become more intensive. There are undoubtedly numerous other smaller areas, but these are the ones into which we may expect fairly large population movements in the future.

There are at least 500,000 farm families now located on lands from which all or a portion must move if the resources of the areas in which they live are adequately to support them. American people cannot be moved, and will not move, on command like an army, but governmental policy and programs, and projects of private enterprise can and should do much to stimulate and give direction to the future movement of population and thus to new settlement.

The homestead program and the railroads did more to guide migrations of the past than anything else. Theirs were the great settlement or resettlement programs while the continent was first being occupied by white settlers. Both of these programs made many mistakes, but out of their mistakes, and their successes, should come the wisdom with which to guide future migrations. This is assuming that there will be programs for such guidance, and that the Government and the railroads will be the two most interested agencies in the future, just as they have been in the past.

Large areas from which there should and probably will be considerable movement in the future are: (1) Areas in which lands should be evacuated or converted into less extensive

uses; and (2) areas in which farms should be enlarged. For the sake of conservation of our natural resources, as well as for the adequate support of the families which live on those resources, some of our types of land should not be farmed so intensively. They should be converted from row culture to grass culture or from grass culture to timber culture. In either case, they produce less intensively and require fewer people for their operation.

In a number of other areas, the basic natural resources are sound, but the number of farm families and farms is too high. The farms need to be enlarged to furnish an adequate income for the support of the farm families. To expand these farms automatically means to eliminate some families.

Between 1841, when the preemption law was passed, and 1862, when the homestead law supplanted it, land in new areas sold for as little as 12½ cents an acre. The cost of homestead lands averaged only about 50 cents an acre. The cost of new land today, brought in because of irrigation or drainage, will probably be $100 an acre or more.

There will not be much opportunity for speculative gain because of big increases in land values on lands that start at $100 or more per acre. Future pioneers cannot therefore expect to accumulate an inheritance from unearned increment.

For Iowa lands — some of which were pre-empted, some homesteaded, and some purchased from the railroads—average values were only $7 an acre in 1860. Within a decade, the lands had trebled in value; in two decades they had doubled that; and in 50 years from the time they were settled, they were selling for 20 times the amount they originally cost. In other words, a 160-acre farm in my home county —Shelby County, Iowa — was worth approximately $1,100 in 1860, but by 1910 it was worth $20,000. In 1920, it was worth $54,000. No such possibilities are in the books for future pioneers.

Pioneering and resettlement programs for our people in the future should benefit from our long and diverse experience of the past. Settlement policies and problems of the future will not be identical with those of the past, and therefore our future settlement policies should be considerably different from those which we have had thus far. Lands to be occupied in the future will not be free or cheap lands. Settlement areas for future development will hold no high prospects for speculative gain. Settlement policies and programs must therefore be wisely conceived and conservatively developed.

The Power of the Horse

Condensed from The Cattleman

Leon Van Meldert

THE horse is a motor. The horse is a machine. How powerful is this machine? It is not very hard to make a test.

All you need is a rope one hundred yards long, at least, two pulleys, two short chains, and a few sacks filled with dirt and weighed.

You fix one pulley high upon a branch of a tree; you fix the other pulley at the foot of the same tree. You pass the rope over the upper pulley, and then under the lower pulley and you fasten at this end of the rope a single-tree. The other end of the rope is laying on the ground and you fix to it, at intervals, sacks filled with dirt starting with the heaviest one: 50-50-25-25-25-10-10-10-10-5-5-5-5-5.

Now you are ready for the test, as soon as your horse has his traces hooked to the single-tree.

You start your horse and he is pulling up the sacks of dirt. How many?

It will depend on the weight of the horse, on his conformation and his disposition. But you will be surprised to find out that a saddle horse will not pull more than 150 pounds, a coacher 205 pounds, a draft horse 350 pounds average.

Years ago, when I started to be interested in the economic efficiency of horses, I made many experiments which were very interesting.

On rails, laid very level, it will take a draft of 5 per cent of the weight of a load to start moving that load. After the load is started it takes less power to keep it moving.

Horses do not pull; they push their collars to which traces are fixed.

A horse pushing 200 pounds in his collar is then able to move 10,000 pounds (five tons) on rails and on wheels.

But all loads are not on wheels and on rails and to be moved, they require more than 5 per cent draft. Such is the case with the plow which requires steady pulling. From experiments made with a coach weighing 1,000 pounds and a two-wheeled cart weighing 500, in order to ascertain the difference in traction needed to start them on different kinds of level roads and with iron and pneumatic tires, I have found the following figures:

Reprinted by permission from The Cattleman, September, 1941

	Coach 1,000 lbs.		Cart 500 lbs.	
	Iron tires lbs.	Pneumatics lbs.	Iron tires lbs.	Pneumatics lbs.
Cobble stone streets	48	26	52	27½
Asphalt roads	40	23	44	25
Shell roads	130	37	118	34

A two-wheel cart of any shape is harder to start than a four-wheel vehicle, but you can make it easier to the horse by starting one wheel before you start the other one.

All horses are different. They may have the same conformation and the same weight, but they have different dispositions and give different results in their work.

When I was living in Europe, I had a warehouse that I was filling with cotton every fall. To save time and space, I was using horses to pull the bales up to their row; but of my five horses, I had only one that was giving me the help I needed. This horse —a mare—was pulling the bale up, stopping with the load on her collar and then backing up to release the bale. She was weighing around 1,200 lbs. and I was using a tackle, three cords supporting the weight. The mare had to walk 30 feet to lift the bale 10 feet. These bales were weighing sometimes as much as 700 lbs. and the mare had to push 230 lbs. into her collar to raise them.

It is a rule in mechanics that all that you win in speed you lose in power and this applies to the horse also.

A horse pulling a plow and traveling two miles an hour can work 10 hours per day and not suffer from this work; but if he goes faster he will not be able to pull much. The trotter traveling a mile in 2.00 minutes, can only pull very little and after 2 minutes of fast going, he may be played out.

And this is the case with the running horse also. To travel one mile in 1:35, he will need a featherweight jockey.

I have seen Texas cow-ponies, carrying a heavy cowboy and his saddle, over 200 lbs. run a quarter of a mile in 32 seconds, which is the speed of a Thoroughbred over a mile, but they could not show so much speed on a mile race.

It is the pace that kills. Extreme speed works against power and efficiency in horse breeding.

A draft horse must be awake, alert, and he must have a big brain, large lungs, a great heart, strong muscles and a strong skeleton. To this add the right kind of conformation.

According to the English

author, Wood, the daily useful work of a horse is decreasing rapidly when the speed increases. If a horse can furnish a maximum of 100, says the French author, Fourrier, the decrease of efficiency by increasing the speed is as follows:

Above this limit of speed the useful work of a horse amounts to nothing, as all the power of the animal is needed to carry his own weight.

In all our horse shows we should get rid of those horses that are leggy and very light in conformation, because those horses cannot give the efficiency that a more powerfully built horse may furnish. A very light horse can go fast, but he will wear out very soon, because he has not the muscles to stand the strain.

There are sometimes exceptional horses, but they are very scarce and most of the time they do not carry on the breeding.

The French pony Daringue trotted 28 kilometers (17½ miles) inside of one hour pulling a cart 600 lbs.; or the mile in 3:43. The French mare Fortunee trotted 40 kilometers (25 miles) under the saddle in 1 hour 27 minutes, or the mile in 3:49 or 17 miles per hour. The American horse Trustee trotted 20 miles inside of one hour, which is a speed of 3:00 per mile and very fast on such a distance.

If you work a span of two horses, you do not get from them the total that each one of them could do separately. At the best, the strongest one will not be able to furnish more power than his mate, unless the eveners are corrected.

If 100 represents the power of a horse working by himself, says Kaduc, then 2 horses working together will only be able to furnish a power equal to 98 for each one of them — 3 horses, 87; 4 horses, 80; 5 horses, 73; 6 horses, 67; 7 horses, 55; 8 horses, 49; and this is easy to understand because those horses are bothering each other. Then one horse working with seven other ones, is only able to furnish half the power of what he could do if he was working by himself. This shows that we should always use as few horses as we can, to do a work and that a good draft horse is more useful than two light horses, on a farm, where all power furnished by horses is a steady pull.

It would be a mistake to want from a horse all the power that he could furnish in a short time. If he is asked to do all that he can, he will do it, if he has been educated to do it. I do not like to say here: *if he has been broken to do it.*

If you ask a horse all that he can do on short notice, the chances are that you are going to

have a balky horse. Spare your horse and you will have a good one. Never ask him the limit of his power.

When you make a pulling test, you should never use a whip. The horse cannot understand why you should whip him when he does his best to please you. He should not be punished for it. If you whip him you will start to make him balky. The thing to do is to take him by the side of his bridle and talk to him and he will soon learn and pull all that he can if you release him as soon as he has been increasing his endeavors.

The power of a horse has been put into figures. It is work, and work, therefore, is equal to the force exerted in the collar multiplied by the distance passed over in the direction in which the force acts, or:

Work = force × distance

W = F D

and there is a limit to F and to D, according to the power of a horse. The work can be measured. The force can be measured in pounds and the distance in feet. Then the unit of work becomes a *foot-pound*, that is, a foot-pound of work done when a force of one pound acts through a distance of one foot.

James Watt (1736 - 1819), Scotch civil engineer, was the first one to give a definition to one horse power. It represents lifting work done at the rate of 33,000 feet-pounds per minute.

There are instruments used to measure power. They are called dynamometers. Those for measuring the draft of wagon and implements are called traction-dynamometers and sometimes recording dynamometers if they are provided with a roll of paper operated by clock mechanism and a pencil.

In the countries where they use the metric system, the H. P. is called C. V. from the French cheval vapeur. It is the force necessary to raise kilo to the height of 75 centimeters per second.

According to the French investigator, Courtois, a horse weighing 500 kilos (1,100 lbs.) can exert a pushing force of 30.58 kilos (67½ lbs.) and during 10 hours of work at the rate of one meter per second, he will furnish a daily total work of 1,100,880 kilogrammeters, while a horse weighing 700 kilos (1,540 lbs.) exerting a pushing force of 71.35 kilos (157 lbs.) in the same conditions will furnish a daily total work of 2,568,600 kilogrammeters. From this we may conclude that 2 horses of 700 kilos each, will give a greater amount of daily work than 3 horses of 500 kilos — 5,137,200 kilogrammeters against 4,302,640 and will require less feed to produce 1,000,000 kilogrammeters.

We can figure the maintaining ration for horses, if we know their weight, and we can also figure the productive ration if we know the work they are called upon to perform which means the kilogrammeters:—1 gram of protein will produce 656 kilogrammeters; 1 gram fat; 1.214 klgm.;—1 gr. carbohydrate 533 klgm. or 3.76 calories and 1 calorie will produce 145 kilogrammeters.

The draft of a plow varies with the soil and depth and width of the furrow. The average in light soil is around 4½ pounds per square inch of the furrow. A 10-inch plow running 6 inches deep will have a furrow with a cross section of 60 square inches and, if the draft is 4½ pounds per square inch, the total draft will be 270 pounds, an easy task for 2 horses weighing around 1,400 pounds.

In Belgium, 2 horses drawing a double Brabant plow in heavy soil, plowing 1½ acres per day at a depth of 8 inches and a width of 11 inches, thus the cross section of 88 inches, were showing a draft of 270 kilos (600 pounds), or 300 pounds per horse, those horses weighing around 1,700 pounds.

Speed per hour		Useful daily work
3,200 meters— 2	miles.....	100
4,000 meters— 2½	miles.....	99
6,000 meters— 3¾	miles.....	94
8,000 meters— 5	miles.....	88
10,000 meters— 6¼	miles.....	68
12,000 meters— 7½	miles.....	51
14,000 meters— 8¾	miles.....	33
16,000 meters—10	miles.....	18
18,000 meters—11¼	miles.....	7

The conformation of the horse has something to do with his efficiency. If the backbone is long, the backbone is weak. In the draft horse, as well as in the running horse, the center of gravitation of the body must be brought forward to give best results. The draft horse must be heavy in front and short in the back.

The color of the horse has something to do with the efficiency of the horse. The gray horse with black head and black legs (blue gray) will give longer service than any other horse of any other color. Here is an average scale of efficiency:

Gray with black heads (blue-gray)	14 years usefulness
Red Roans	13 years usefulness
Strawberry Roans	12 years usefulness
Bays	11 years usefulness
Sorrels	10 years usefulness
Blacks	8 years usefulness

We can make a graph showing how weight in the horse will influence his efficiency. At one of the extremities of the ordinal is a horse weighing 250 pounds (an Icelander pony) whose work does not amount to much and at the other extremity is a horse weighing 1,700 pounds that is able to draft 350 pounds steady during 10 hours. The curve of the abscissas shows that there is a progressive trend toward the heavier horse.

More Flax

Condensed from Successful Farming

Arthur Lester

TODAY, flax holds a position of importance in our National Defense program. In the Defense field, everything from gunstocks to battleships requires finishes—paints, varnishes, and the like. Vast quantities of finishes are also necessary for commercial purposes. And for years, linseed oil, the oil removed from flaxseed, has been the best drying oil for use in these finishes.

The drying industries in general—paints and varnishes, linoleum and oilcloths, and printing inks—used 98 percent of our linseed oil during peacetime. In fact, linseed supplied more than two-thirds of their oil requirements. Tung oil, most of which was imported from China, was the second largest source of supply.

Difficulties connected with the importation of tung oil have made linseed oil the only high-type drying oil obtainable in large quantities at the present time. Consumption in 1940 required approximately 31½ million bushels of flaxseed. Last year consumption totaled about 45 million bushels. Even peak production by American farmers has never been sufficient to meet this demand. Needs in excess of production have been met with imports, principally from the Argentine, which have averaged about 15 million bushels of flaxseed each year during the last 10 years.

Flax has, however, shown an upturn lately—due partly to better prices, partly to the salesmanship of the Flax Institute, and partly to the regulation of the AAA making flax a non-soil-depleting crop when grown with certain legumes and grasses.

When my father first grew flax, it was a "new land" crop to be grown on virgin prairie land or on land that had not raised a crop of flax for some years. He, and other farmers in the flax-producing areas of Minnesota and North Dakota, had learned you just couldn't follow flax with flax. The second planting wouldn't make a profitable crop.

It was for scientists at the North Dakota Agricultural College, particularly H. L. Bolley, to prove that these crop failures were due to a flax-wilt disease. Development of wilt-resistant varieties followed, but it required many years to make farmers be-

Reprinted by permission from Successful Farming, Des Moines, Iowa, March, 1942

lieve a variety could be grown on "sick" land and would produce an abundant crop.

By far the most commonly grown variety today in Minnesota and in other Midwestern states is Bison, a North Dakota variety introduced to the public in 1926. It yields well and gives generally excellent resistance to wilt.

Redwing, developed by the Minnesota Agricultural Experiment Station and distributed in 1930, "has been a very much underestimated and under-rated variety for Minnesota," according to A. C. Arny, Minnesota's veteran flax breeder.

The Minnesota institution has distributed seed of another new variety for planting this spring. Called "Biwing" after its two parents, Bison and Redwing, it is said to combine to a high degree the desirable qualities of both. From Bison, Biwing has inherited moderately large seed size, medium-high oil content, exceptional resistance to wilt, and high yielding ability. From its Redwing parent, this new variety inherited high oil-drying quality, moderate resistance to flax rust, and high yielding ability.

"But," said Professor Arny, to whom goes much credit for the development of this new flax, "Biwing is not the ultimate variety for Minnesota. It is only moderately resistant to rust. A variety more resistant is desired." And, of course, experimental work is being conducted with that aim in mind.

Because flax is a poor weed fighter, it is generally grown on the cleanest land a farmer has. Newly turned sod of pasture and meadowlands and clean corn stubble are particularly good.

H. H. Laude, professor of farm crops at the Kansas State College, reports that in his state experiments have demonstrated the importance of planting flax after a legume or sod crop. "Flax does especially well when planted after soybeans. A good flax seedbed can be prepared after soybeans at very little expense. Flax is a desirable crop to grow in eastern Kansas, and an increase in flax and soybean acreage can be made there by a moderate reduction in the acreage that has been used for wheat. Such a shift appears desirable."

Kansas experiments have shown the advisability of seeding early and at a high rate, Professor Laude advised. Before results of experiments were available to indicate proper cultural methods, the common practice was to plant flax after corn, merely disking the ground in the spring to prepare the seedbed. The crop generally was sown at the rate of 20 to 25 pounds of seed per acre in April and May.

"Our experiments show that

the yield of flax can be nearly doubled by using improved varieties, preferably Linota, Redwing, or Bison, planting the flax after soybeans, and seeding in early March at the rate of 40 to 45 pounds of seed per acre," Professor Laude said.

Here is a point that contradicts the belief of many. "Flax is no more harmful to the soil than other crops," said A. C. Dillman, associate agronomist in charge of flax investigation with the Federal bureau of plant industry. "However, it responds well to good agricultural practices, including crop rotation."

At best, flax isn't a high-yielding crop. Government reports show, however, that as the crop has moved from the semi-arid plains of Montana, North and South Dakota eastward into the better lands of the eastern Dakotas, Minnesota, and northern Iowa, crop yields have climbed from an average of seven bushels per acre to ten bushels. Experimentally, the crop yields at the North Dakota Experiment Station have averaged 14 bushels per acre. Back in 1929 we grew 20 acres of flax at home that yielded 18 bushels per acre. The field had been in pasture for many years and had been manured heavily during that time.

According to E. J. Mitchell, of the Flax Institute of the U. S., the eastward movement of the flax crop has given an excellent cash crop to an area where one was badly needed.

It is his opinion that flax fits into the farm economy where the average annual rainfall is upwards from 20 inches, and where this rainfall does not come too close to the maturing period. In the more humid Eastern states, flax growing seems to be more or less impractical, and altho plantings have been increased in Illinois, Ohio, and Indiana in the last few years, results have not been outstanding. With a few exceptions, Mitchell believes that time, effort, and money can be spent more advantageously in the old established flax - growing areas.

A new development in the flax industry during the past few years has been the increasing demand for flax straw to be used largely in the manufacture of cigarette paper. It is estimated that from the 1941 flax crop approximately 250,000 tons of flax straw were purchased in Minnesota, which is the principal source of flax straw for cigarette paper manufacture at the present time.

Although the usual price for flax straw ranges from $1.50 to $2 per ton, Mitchell warned against too much optimism towards this as a source of income. It is his belief that most farmers can use their straw more profitably right at home than by selling it to tow

manufacturers. Also, he explained, flax straw infested with weeds is unsuitable for decorticating.

Under peacetime conditions we were an importing nation, and now, with our wartime demand in the neighborhood of 45 million bushels, the tariff reduction may be only sufficient to aid us in meeting our needs.

The Department of Agriculture has asked that 1942 acreage equal the 3,250,000 acres on which aproximately 31,825,000 bushels were grown last year. Of this, about half was grown in Minnesota. Last August, the Department fixed a loan price on flaxseed on the farm based on a price of $1.85 per bushel at Minneapolis.

Always on the horizon, though, is the soybean crop. Chemists may succeed in inducing chemical changes in soybean oil that will produce an oil with a drying capacity equal to even the best linseed oil. Laboratory reports indicate that progress is being made in this direction.

But, for the present, conditions look bright for the flax grower. The commercial and wartime demand should mean a good price for domestic flaxseed despite the tariff reduction. Marketing and storage facilities are such that a large domestic crop can be handled without undue pressure and consequent reduction in prices. Cost of production is not materially higher than that for other small grains. Yield times prices generally gives a more satisfactory return from flax than from wheat, barley, oats, or rye.

There are still at large in the world some 20,000 kinds or species of insect pests which have not yet been found in the United States.

—*Southern Agriculturist*

Why Creep Feed Calves?

Condensed from The Shorthorn World

Earl W. McComas
Animal Husbandman
Bureau of Animal Industry—U. S. Dept. of Agriculture

IT is a well-known fact that calves nursed by cows which afford them a liberal supply of milk make more rapid growth, weigh more at weaning time, and consequently are more profitable than calves whose dams afford them only a moderate amount of milk.

Nevertheless, as a calf grows and develops it seeks additional nutrient in somewhat more concentrated form, such as grass, if it is on pasture, but it will become interested in hay or other forage that is available in the absence of grass.

At first it was believed that this concentrate had best be a mixture of oats, corn, and bran, equal parts by weight, and it is a fact that such a combination is useful. But considerations of economy, and in some cases availability of these feeds, as well as the desire to learn if some other combination would give better results, led to several experiments along that line.

In experiments with Shorthorn calves carried on at Sni-A-Bar Farm by the U. S. Department of Agriculture and the University of Missouri, the calves that ate an average of approximately 460 pounds of shelled corn, 200 pounds of oats, and 60 pounds of linseed meal a head in addition to pasture and milk from their dams weighed a little over 100 pounds a head more when weaned at 8 months of age than did similar calves running with their dams on pasture but fed no concentrates. Besides, the calves fed the concentrates were much fatter than the others.

Later an experiment was set up to compare a combination of shelled corn, 8 parts, and cottonseed cake, 1 part, with shelled corn and also with shelled corn, 2 parts, and oats, 1 part. All parts were by weight. In three successive years the steer calves fed the shelled corn - cottonseed cake combination gained 21 pounds more than the calves fed shelled corn, and 24 pounds more than the calves fed the corn-oats combination. Furthermore, the calves fed the shelled corn-cottonseed cake were valued the highest—45 cents a hundredweight higher

Reprinted by permission from the Shorthorn World, December 25, 1941

than those fed shelled corn and 50 cents a hundred higher than those fed corn and oats.

In another experiment a mixture of shelled corn, 8 parts, and cottonseed cake, 1 part, gave better results than a mixture of ground corn, 8 parts, and cottonseed cake, 1 part, both in respect to gains and to net returns.

The experiments that have been mentioned were carried on in the Middle West, but in the West, South, and East results have generally been similar, even though the kinds and proportions of concentrates used have differed. For example, the Texas Agricultural Experiment Station fed a mixture of ground milo and cottonseed meal to range calves running with their dams and, even under those conditions, found that the calves gained enough more than calves not fed a concentrate to justify the expense of the concentrate eaten.

In California, barley, either steam-rolled or coarsely ground, has been used very satisfactorily in place of corn in a concentrate mixture for creep-fed calves.

In the South, velvet beans may be used to advantage. Logically, a cattleman should consider the matter of cost as well as the availability of feeds. In most instances home raised feeds will be found the cheapest and thus be used so far as possible.

Although in the experiments that have been mentioned the protein concentrate in mixtures consisted of either cottonseed cake or linseed cake, others such as peanut cake or soybean cake may be used when they can be obtained at a more favorable price.

The location of a creep is a rather important matter. Calves will get the habit of entering a creep more readily if it is placed in a shady spot where the herd is accustomed to gather after drinking. A self-feeder is useful but not necessary. However, when a feed trough is used it should be set low enough so that young calves can reach the concentrates easily and it should have some sort of roof to keep the rain from spoiling the feed.

If the calves have not learned to eat grain before they are turned out to pasture, it will be necessary to herd them into the creep a few times in order to acquaint them with the feed. However, they readily acquire the habit of entering the creep on their own account and thereafter about all that is necessary is to make certain the supply of feed is not exhausted.

Most of the experiments in creep - feeding have involved grade calves, but "what is sauce for the goose is sauce for the gander," for a purebred breeder is probably even more anxious

to have his calves develop at as fast a rate as they are capable of doing than the breeder of cattle destined for the block, since the purebred breeder has more at stake. In this regard an experiment in the South is of interest. There it was found that when purebred calves were creep-fed cracked corn, coarsely ground oats, and cottonseed cake in a 3-2-1 ratio, they averaged a little over 100 pounds a head heavier and displayed considerably more condition than others of the same breeding which were not creep-fed. When these calves were valued as breeding animals, even on a very conservative basis, those that had been creep-fed were worth from 15 percent to 45 percent more a head than calves of similar breeding that had not been creep-fed. Buyers of young breeding stock frequently are influenced by their condition, in which case it often happens that well-bred calves are sold at prices well below their intrinsic value.

Creep - feeding calves has proved to be a worthwhile practice generally. Calves fed in this manner grow and fatten faster than those raised to weaning age on their dams' milk and grass or other forage; the additional gain justifies the cost of the concentrates eaten; the cost of this gain is less than that obtained by stall or lot feeding, and as a rule results in considerably larger profit to the beef cattle raiser.

A New Crop for the South

Condensed from Texas Farming and Citriculture

W. H. Friend

Supt. of the Lower Valley Experiment Station, Texas

SUNN Hemp, known scientifically as *Crotalaria Juncea,* derives its popular name from its hemp-like appearance. It is unquestionably the best summer legume for soil improvement yet introduced by the Valley Experiment Station. In addition to the outstanding qualities which make it the best known crop for soil improvement, it now appears to have value as a forage crop. This species must not be confused with *Crotalaria Spectabalis* or other of the commonly used types, which are poisonous plants and are useful only for soil improvement. These other types of Crotalaria are not well adapted to our conditions and are distinctly inferior to Sunn Hemp in every way. The Valley Experiment Station has found that Sunn Hemp germinates quickly, grows off rapidly, will choke out noxious weeds and grass, is highly resistant to root rot, is immune to nematodes, produces unbelievably high yields of humus-forming material of high nitrogen content that decomposes rather rapidly. It seems almost too good to be true to learn that this crop, which thrives like a weed in Valley soils, is also a valuable forage crop.

A publication of H. L. Hall and Son, Ltd., of Mataffin, Eastern Transvaal, Africa, gives an interesting discussion of Sunn Hemp. It might be pointed out that the seasons in South Africa are exactly the reverse of ours, and the planting date they suggest, November, would correspond to March planting in the Valley. The bulletin states: "The plant is a member of the Pea and Bean family (Leguminosae) known botanically as Crotalaria Juncea. It is grown as a cover crop of green manure in many tropical and sub-tropical countries. It is also a valuable fibre plant.

Sunn hemp is a stiff, shrubby annual, usually about four to seven feet high, with narrow leaves two to three inches long. Like many other leguminous plants, it is able to utilize directly the nitrogen of the atmosphere, and being a plant of very rapid growth is capable, when sown

Reprinted by permission from Texas Farming and Citriculture, February, 1942

thickly, of smothering many weeds. It is of value as a cover crop and as a soil renovator.

For these reasons Sunn hemp is often grown as a rotation crop immediately before such crops as winter vegetables, mealies, sugarcane, tobacco, potatoes, etc., and also on lands newly brought under cultivation, as it will thrive even though the tilth is not good. It is hardy, free from serious pests, requires no weeding, and is not affected by eelworm. It is one of the best crops for cleaning and preparing land for arable cultivation or permanent crops.

As a summer green manure crop the plant has proved to be one of the very best in tropical and sub-tropical areas.

It is hardy and grows rapidly, so if sown in November or December (March or April) it can be ploughed under in February and March (June or July) while the soil is moist, by which time it should yield ten to twelve tons of green manure per acre. The land thus manured is ready for another crop in April (August). Few plants lend themselves so effectively to double cropping as Sunn hemp. It is easily ploughed under.

Cattle and horses are fond of it in its green stage. It has been noticed that spans of oxen used for ploughing under the green crop put on weight on the job. It makes good ensilage.

Sunn hemp will grow on almost any kind of soil. The plant is grown from seed which germinates very rapidly. The amount of seed required per acre varies greatly with the mode of sowing. For green manuring, sow 20 to 30 lbs. per acre. As a cover crop for smothering weeds, 30 lbs. to 40 lbs. per acre. The thicker and more even the stand, the easier it is to plough under. The all-important point is to prepare the land thoroughly at first, to ensure a uniformly close stand and rapid growth.

With us, Sunn hemp is practically free from diseases and pests.

Plough under as a green manure when in flower, and before the pods begin to set on. In open lands it will be found a great help if a single, or double, furrow plough is used to open up the furrows of each cut when the Sunn hemp is two to three feet high, while it is possible to strike out straight lines. If left until later, the height of the plants obscures the view of the person ploughing, and it is almost impossible to strike out straight furrows. In orchards this is not necessary.

We farmers must keep up the humus content of our soil, as by so doing we improve its texture, causing it to be more easily worked and enabling roots to make greater growth. Humus is

rich in nitrogen and assists in preventing nitrogen from being leached out of the soil; also, it keeps the phosphates in the soil available to plants. Its greatest value in this country (South Africa) is possibly in increasing the moisture-holding capacity of the land. This can mean a lot to the citrus and mealie grower.

Besides adding nitrogen and smothering weeds, Sunn hemp gives a huge return of humus per acre. For nodules, root system, humus and ease in turning under, it is second to none. It will stand drought, eelworm and weeds better than any other cover crop.

Experiments conducted in Rhodesia concerning the use of Sunn hemp as a hay crop prove it to be a useful crop for this purpose. To get Sunn hemp at its best for hay, it should be cut in the early stages, just before the bud stage, and then, if properly cured, should prove both palatable and of good feeding value. It is important to cut before the stalk becomes hard. It will give an excellent yield for hay and besides this, the soil will be improved by ploughing in the stubble. Sunn hemp is very useful for this on account of the large tonnage per acre, and in addition the turned-under-stubble improves the soil.

This information about Sunn hemp in South Africa, and the findings at the Experiment Station as to its special adaptability to Lower Valley conditions, suggests that this section, besides the numerous benefits to be derived from growing the crop here, could have almost a monopoly in seed production. It appears that the Lower Valley is one of the very few places in the United States in which Sunn hemp can be produced. The seed is expensive because of its scarcity, and present stocks must be used for seed until a sufficient supply is available for wide-scale planting.

Production Testing in Purebred Hog Selling

Condensed from American Hampshire Herdsman

Dr. L. E. Hanson
University of Nebraska

MORE than 40 years ago the alert and farsighted Danish farmers, extension agents and breeders organized a swine testing project in Denmark. The purpose of this project was to develop breeding stock which was of superior producing ability and which produced pigs of superior carcass quality. That the Danes have been very successful is a well established fact.

One of the outstanding achievements of their program was the remarkable prolificacy obtained with their swine. For the test year of 1936-37 one of their breeds had an average of 11.7 pigs farrowed and 9.0 pigs weaned per litter; the other breed had an average of 12.2 pigs farrowed and 9.3 pigs weaned per litter.

This remarkable record of pigs farrowed and weaned is not an average of a few herds, it is the average of all of their purebred breeding establishments — about 250 of them. This excellent record of prolificacy was not an abnormal record. A study of the records for the preceding 30 years showed that the prolificacy of their swine had gradually been built up to this level.

Similar improvements have been made in Denmark in the efficiency of gains, and the improvement in carcass quality is even greater. At the present time the testing of our pigs for efficiency of gains and for carcass quality, as it is done in Denmark, is not practical for economic reasons. However, brood sow testing as it is done in the Hampshire Registry of Merit and Herd Production Futurity is certainly practical and is a much needed step in the right direction.

The object of brood sow production testing as it is set up in America is to locate the breeding stock of superior producing ability and from it develop superior producing strains. At the same time this plan also strikingly points out to the breeder his poor producing animals, and if he is wise he eliminates them from his herd.

In the Registry of Merit program producing ability is measured in terms of pigs farrowed and weaned, and weaning weights. These factors are important. We all know that the first essential to efficient production is prolificacy and the ability of the

Reprinted by permission from the American Hampshire Herdsman, August, 1941

sow to raise a high percentage of the pigs farrowed. It is difficult, except under the most favorable circumstances, for a hog man to make a profit on a small litter. Weaning weights are important because they are an indication of the sow's milking ability and the pigs' ability to consume feed—milk from the sow and other feed—and their ability to make rapid growth.

Thus, in your Registry of Merit program you have the essentials for locating the sows of superior productive ability. Hampshire breeders are to be congratulated on being the first breed association to promote an advanced registry and on the progress made so far.

In the early days of the purebred industry almost any purebred boar made a big improvement in the pig crop when mated with the average farmer's sows. This was possible because the average farmer's sows were quite inferior in type and productive ability. Today this situation no longer exists in the Cornbelt. Most of the Cornbelt hogs of today are either grades or nonregistered purebreds, and it takes more than just a registered boar to improve these swine from a production standpoint.

Perhaps some of you are not particularly interested in what the farmer wants, but are more interested in trying to satisfy some of your fellow breeders. Such a policy is not only shortsighted but it is extremely dangerous for the welfare of the purebred industry. Those of you who were in the purebred business in the 20's can remember what happened when the breeders forgot the men who raise hogs for the market and vied with each other to produce the highest backs, heaviest bone and longest legs. During the early 20's some of the least practical kind of purebred hogs that ever walked on the face of the earth were made champions of the showring. And those breeds eventually suffered a tremendous loss of popularity. You, purebred breeder, do not want to forget that if the farmer cannot make a profit on the kind of hogs you are raising, neither will you.

I do not mean to imply that the showring is not worthwhile. I believe the showring has done and is doing much to bring to the attention of the swinegrowers the kind of hogs that they should be growing—with the exception of the period in showring history which I have mentioned. However, the time is rapidly approaching and in some sections has already arrived when showring winnings are not a complete enough measure of an animal's value for breeding purposes.

About 5 years ago the extension men, vocational agricultural

instructors and farmers in southern Minnesota decided they needed something more than purebred boars if they were to improve the productive efficiency of their swine. These folks got together and organized a production testing project and last year there were about 500 farmers taking part.

If the commercial hogman can afford to keep production records on his swine, how can purebred breeders afford to not bother with it? As a general rule the hog growers look for the breeders to set the pace. Now, in southern Minnesota the commercial hog growers are setting the pace and hoping that the purebred breeders will come along. Already there is a scarcity of boars with production records back of them.

The value of production testing of swine has long since been proved in Denmark. Its value has been clearly demonstrated among the hog growers of Minnesota, so get back of your Registry of Merit program 100 percent. You have to keep records of the prolificacy of your sows and the small additional labor involved in getting weaning weights is well worth the effort. Perhaps some of you feel that you know which sows are weaning the heaviest litters, but I will wager that you will be very much surprised at what you find if you get actual weights for your record book.

Production records are not only desirable from the standpoint of pointing out what the individuals actually are doing, but they are also a favorable influence on management practices and culling. Spectacular progress in swine improvement due to improvement in the average of the breed can be expected and will occur by the elimination of the individuals of poor productive ability. The average 56 day litter weaning weight of purebreds of all breeds is about 168 pounds. Now, if we can eliminate those sows which are weaning litters weighing no more than this, and I am confident that we can, it is not difficult to see how quickly our breed averages can be improved.

In the future it is going to become increasingly difficult to sell breeding stock which is not backed by production records. That day has long since arrived in Denmark; it is rapidly approaching in southern Minnesota, and as more and more farmers see the advantages of production testing, less and less of them will be interested in stock which is not backed by official records. The time is approaching when it will be just as illogical for a hog grower to buy a boar from untested stock as it is at present for our good dairy cattle breeders to buy bulls without production records back of them.

Sudan Grass

SUDAN grass was introduced into this country in 1909, being imported from Khartum in the Sudan region of Africa. The first planting was made in the Chillicothe Experiment Station in Texas, and within the next few years the U. S. Department of Agriculture established trial plantings in various sections of the country. Most of these experimental plantings were so successful that Sudan grass soon became widely grown in sections which proved to be adapted to its culture.

Sudan grass is an annual grass which makes very rapid growth. When it is planted in rows and grown as a cultivated crop on highly fertile soil it sometimes attains a height of from 7 to 9 feet, and produces thick, heavy stems a quarter of an inch in diameter. When it is sown broadcast the stems are much finer, and it seldom exceeds 3 to 5 feet in height. Sudan grass is closely related to the cultivated sorghums and resembles them in many respects. When planted sparsely, it has a tendency to form stools or tussocks and anywhere from 50 to 200 stems may be produced from a single crown.

Although it is noted for its ability to thrive on soils of widely varying types, Sudan grass makes its best growth on fertile, well drained loams with a pH ranging between 5.0 and 6.5. On thin, upland soils it makes but poor growth and yields are so light that it ceases to be a profitable crop. Sudan grass perfers a warm summer climate where the humidity is relatively low, and it is particularly well adapted to the semi-arid regions of the Great Plains. It is now grown to some extent in Oregon and Washington, and is becoming increasingly popular in the corn belt and eastward through Ohio, Pennsylvania and New Jersey. As it cannot endure excessive humidity it does not thrive well in the Gulf States.

It is very important that Sudan grass seed be free from Johnson grass seed. Johnson grass has become such a troublesome pest in many sections that every effort must be made not to introduce it by purchasing impure Sudan grass seed. The seeds resemble each other so closely that only an expert can distinguish between them. Good clean seed should weigh between 35 to 40 pounds to the bushel and should have a guarantee of 98% purity. Germination should range around 90%.

Sudan grass seed should not be sown until the soil is thoroughly warm in the spring, and

all danger of frost is over. The usual date for the first sowing is about a week after corn planting time. Sudan grass may be planted at any time during the summer up to within 70 to 80 days before the first autumn frosts. In semi-arid regions Sudan grass is usually planted in rows. In Texas the highest yields of hay have been obtained when the seed was sown in rows 18 inches apart, while the highest yields of seed have been harvested when the rows were spaced 36 inches apart. In more humid sections Sudan grass is usually sown with a grain drill or is broadcast with a hand seeder. On rather thin upland soils the most satisfactory results will be obtained if the seed is sown in rows and grown as a cultivated crop. The rate of seeding varies from 3 to 5 pounds per acre when sown in rows, and from 20 to 30 pounds per acre when it is drilled or sown broadcast.

In order to increase the protein content of the hay or forage, Sudan grass may be grown in combination with soybeans or with cowpeas. As the Sudan grass matures more rapidly than the legumes, it should not be planted at the same time. It is advisable to sow the soybeans or cowpeas in rows and to cultivate them until they have reached a height of 8 to 10 inches. The Sudan grass may then be sown broadcast over the field ahead of the cultivator. The usual rate of seeding is 40 to 60 pounds of soybeans and from 12 to 25 pounds of Sudan grass seed per acre.

Sudan grass produces a bright, sweet, palatable and highly nutritious hay. It is eaten eagerly by all classes of livestock, being greatly relished by cattle and horses. Although it appears coarse, even the ends of the largest stems are eaten readily, and there is absolutely no waste in feeding it. It compares favorably with timothy hay in feeding value, being slightly higher in protein, and slightly lower in fat. Yields range from 2 to 4 tons of hay per acre. On certain irrigated areas where conditions are exceptionally favorable, yields of 10 tons per acre have been recorded. In the North and East 2 cuttings of hay are usually made, while in some sections of Texas 3 to 4 cuttings are frequently made. For the best quality of hay and for maximum yields, Sudan grass should be cut when in full bloom. When more than one cutting is to be made, it is sometimes necessary to cut it as soon as it heads out well, in order not to delay the succeeding cuttings. If weather conditions are unfavorable and cutting must be delayed, Sudan grass can stand for some time without deteriorating to any great extent. Sudan grass hay is very easily cured. In good

haying weather it may be cut in the morning and raked into large cocks in the afternoon. It should be allowed to remain in the cocks until it is thoroughly cured. It is usually cut with a mower, although in some sections farmers prefer to cut it with a binder and to handle it as if it were sheaf hay.

Sudan grass is very valuable as a supplementary pasture during the summer months, as it is relished by all classes of livestock and has excellent carrying capacity. Under average conditions it will carry from 2 to 3 animal units per acre for a period of 2 to 3 months. It is usually ready to pasture within 6 to 8 weeks after seeding. If pastured lightly at first it will continue to make rapid growth and may be pastured more heavily later in the season. Whenever it is possible to do so, it is wise to practice rotational grazing, allowing each field a rest period of several weeks. If growth is very uneven, or if it is not eaten down sufficiently, clipping the pasture with a mower is recommended in order to stimulate new growth. In Texas, where it is usually planted in rows for pasture purposes, it is customary not to turn stock in on it until the plants have reached a height of 15 to 18 inches. In more humid sections where Sudan grass is commonly drilled or sown broadcast, it is usually pastured when it has reached a height of 6 to 12 inches.

When Sudan grass has been injured by drought, or when other unfavorable climatic factors have caused a stunting of growth, there is danger of prussic-acid poisoning. Cattle and sheep are particularly susceptible, hogs and horses slightly less so. There is comparatively little danger of poisoning when feeding well cured Sudan grass hay.

Sudan grass may be used for silage purposes, either alone, or in combination with cowpeas or soybeans. It should be harvested for silage when the seeds are in the hard dough stage. Sudan grass silage is about equal to corn silage in feeding value, but is considerably less palatable.

When grown for seed, Sudan grass should not be harvested until the seeds on the main stems are thoroughly ripe and hard. It is usually cut with a grain binder, set so that it will tie small bundles. These should be put into well capped shocks and left until thoroughly cured. Yields of seed range from 150 to 350 pounds per acre, and about one ton of straw will usually be obtained as a by-product.

Soil Acidity for Farm Crops

Condensed from The Ohio Farmer

C. G. Williams

IN order to get information upon this subject the Ohio Agricultural Experiment Station has been conducting an experiment for the past eight years with eleven farm crops grown on five different soil reactions, ranging from pH 4.7 to pH 7.5.

The soil treatment, aside from adjusting the soil reaction, consists of an application of 40 pounds of muriate of potash per acre on corn and 50 pounds on the small grain—wheat, oats or barley—and 200 pounds of 20 percent superphosphate broadcast on corn and 400 pounds on the small grain. The small grain varies in the different rotations.

Five different soil reactions are involved in this test, namely, pH 4.7, 5.0, 5.7, 6.8, and 7.5. The pH 4.7 was attained by the addition of aluminum sulfate and sulfur.

All of the eleven crops are much poorer on the pH 4.7 soil than on the other reactions. The crops which stood this acid condition best are oats, wheat, soybeans and corn. Barley and sweet clover were total failures and alfalfa was a close second. Soybeans is the only legume that approximated success.

At pH 5.0 oats was the only crop that gave over 90 percent of a full crop. No legume reached more than 29 percent of a full crop except soybeans which rated 79 percent.

Mammoth clover and alsike withstood acid conditions a little better than red clover.

At pH 6.8 corn, wheat, alfalfa, alsike and mammoth clover, soybeans and timothy gave maximum yields, and all were in the high 90s except sweet clover, which reached 89 percent.

Six of the eleven crops under test gave slightly larger yields at pH 6.8 than at 7.5, namely corn, wheat, alsike and mammoth clover, soybeans and timothy. Alfalfa was equally satisfied with both reactions.

It should be stated that on similar land which did not receive any superphosphate ten of the eleven crops gave best results at pH 7.5. Corn was slightly better at pH 6.8.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.

Electricity in the Home and on the Farm, by Forrest B. Wright ($2.75). Published by John Wiley and Sons, Inc.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00. J. B. Lippincott Co. $5.00.

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.

Fruit Crops—By T. J. Talbert, Prof. of Horticulture, Univ. Mo., and A. E. Murneek, Asst. Prof. Horticulture, Univ. Mo. Lea and Febiger. $3.75.

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Review. $2.50.

Home Vegetable Gardening—By Charles S. Nissley, Extension Horticulturist in Vegetable Growing. Publ., Rutgers Univ. Press (1942). $1.50.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of the Horse—By George R. Conn, B.S.A.H., D.V.M. Publ., Orange Judd Publishing Co., Inc. (1942). $1.50.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Publ., Orange Judd Publishing Co., Inc. (1942). $1.50.

The Nutgrowers Handbook—By Carroll D. Bush. Publ., Orange Judd Publishing Co. $1.75.

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.

For the convenience of our readers, books listed may be purchased through this Department. Address Farmers Digest, Ambler, Pa.

BRIEF BOOK REVIEWS

Farm Management and Marketing—By V. B. Hart, Ph.D., Extension Professor, Farm Management; M. C. Bond, Ph.D., Extension Professor of Marketing; L. C. Cunningham, Ph.D., Extension Associate Professor, Farm Management; all at the New York State College of Agriculture, Cornell University.

This book deals with the business problems of farmers. Its scope is wide: All the important economic factors which affect the farmer's income are dealt with, including not only size of business, labor efficiency, and marketing of specific farm products, but also credit, land utilization, prices and kindred subjects. It is the authors' belief that these latter factors contribute much to the success or failure of a farm business.

Designed primarity for students of agriculture in high schools and colleges, it is a book which will be found useful to farmers and all others interested in agriculture.

Publishers: John Wiley & Sons, Inc. (1942). $2.75.

INDEX

Beef Cattle

Kansas Grasses Walk to Market..March, 1941
Herefords in New England .....April, 1941
Choice Steers Return More Profit..June, 1941
Crossbred Calves Make Good Beef..June, 1941
Cattle Experiments .....July, 1941
Forage Beef .....Aug., 1941
The Cow Herd .....Sept., 1941
Calcium Needed in Fattening Rations, Oct., 1941
Type as a Factor in Judging .....Nov., 1941
Wintering the Herd .....Dec., 1941
Driving Chance Off the Range.....Jan., 1942
Vitamins for Beef Cattle.....Jan., 1942
How Permanent Is Type? .....Mar., 1942
Prevention and Control of Calf Scours, Mar., 1942
Cow Housing Experiment .....Mar., 1942
Feed Lot Equipment .....April, 1942
Lower Beef Costs .....May, 1942
Fitting Steers for Show .....May, 1942

Conservation

Ecology and Land Use .....Jan., 1941
The Road Back to Soil Fertility....Feb., 1941
What is Ecological Thinking?.....Feb., 1941
Fencing to Fit Round Farming....April, 1941
New Movement Takes Root .....May, 1941
Hard Work, But No Hard Times..June, 1941
Undercover Farming .....June, 1941
Contour Lines .....July, 1941
There's Probably a Good Farm Underneath, Aug., 1941
Cover Farming .....Oct., 1941
Power Weed Burner .....Oct., 1941
The Land and the People .....Nov., 1941
An Anthology .....May, 1942

Crops

Inoculate Those Legumes .....May, 1941
Red Fescue .....May, 1941
The Magic Vine .....May, 1941
What About Flax? .....June, 1941
Corn Sprouts New Wings.....June, 1941
To Fight Alfalfa Wilt .....July, 1941
Making Soybean Hay .....July, 1941
Lespedeza Takes Over .....Aug., 1941
A New Legume-Lotus Corniculatus..Sept., 1941
One Man Looks at One Weed .....Nov., 1941
Brome Grass .....Nov., 1941
Piper Velvet Bent .....Nov., 1941
Little Beans—Big Business .....Dec., 1941
New System Farmer .....Dec., 1941
New Control for Corn Ear Worms..Dec., 1941
High Cotton Yields .....Jan., 1942
Crop Insurance Dollars .....Feb., 1942
Cotton Grown to Measure.....Feb., 1942
Modern Rain Makers .....April, 1942
Kudzu—Mender of Tattered Lands, April, 1942
Mystery Fiber Produced in Florida..April, 1942
Seed Treatment for Cereals and Corn, May, 1942

Dairy Cattle

A Case of Posthumous Breeding...May, 1941
Feed from the Air .....May, 1941
Pre-Milking of Heavy Producers...July, 1941
Acetonemia in the Dairy Cow.....July, 1941
Progress in Breeding for Fat Tests..July, 1941
Making Veal from Dairy Calves ...Aug., 1
Uniformity through Inbreeding ...Aug., 1
What Price Breeding? .....Aug., 1
Improving Milk Through Feeds....Aug., 1
Red Umbrella Selling .....Sept., 1
The Four-Handed Milker .....Sept., 1
War on Mastitis .....Sept., 1
Early and Late Calving of Dairy Heifers, Sept., 1
Peanut Meal as a Source of Protein..Oct., 1
Influence of Processing on Milk....Oct., 1
Pasture Fly Trap .....Nov., 1
Factors Concerned in Efficient Milking, Nov., 1
Effect of Shark-liver Oil on Milk Production, Dec., 1
Calving Time .....Dec., 1
Ten Bull Battery .....Jan., 1
Preventing Cattle and Sheep Bloat..Jan., 1
Packers Want Top Veals.....Jan., 1
How Much Dairy Grain? .....Jan., 1
Trichomoniasis in Dairy Cattle.....Jan., 1
Breeding and Feeding Young Stock..Feb., 1
Dairy Cattle Feeding .....April, 1
How Much Rent Can a Cow Pay?..April, 1
Feeding the Herd Sire .....May, 1
Raising Calves When Milk Is Scarce..May, 1
Rabbit Box Calf Pens .....May, 1

Farm Machinery

Rubber Tires vs. Steel Wheels .....Oct., 1
The Most from the Motor .....Nov., 1
Mechanized Land Clearing .....Dec., 1
New Roughage Harvester .....Jan., 1
Winter Care of the Tractor.....Jan., 1
Tractor Costs vs. Horse Costs ....April, 1
Justifies Mechanization .....April, 1
Portable Lumber Harvester .....Oct., 1
You Can Ventilate That Stable.....Jan., 1
Tooling Up for Soil Conservation...Jan., 1
Speed in Farming .....Jan., 1
Bale-Chute Saves Labor .....Jan., 1
Farm Machinery in 1942 .....Mar., 1
The Most from a Gallon of Gas ...Mar., 1
Push Button Barn Cleaning .....Mar., 1

Fruit

New Practices to Regulate Fruit Crop, May, 1
Strawberries for the Home Garden..May, 1
Blueberries in the Garden .....June, 1
Diversification on the Fruit Farm..June, 1
New Control for Peach Borer .....July, 1
New Orchard Culture .....Sept., 1
Storage and Transportation of Fruit..Nov., 1
Safe Tractor Operation .....Nov., 1
Orchard Replacement .....Dec., 1
Controlled Atmosphere Storage ....Jan., 1
Pruning Peach Trees for Early Production, Feb., 1
Encouraging Trees to Root Deeply ..Feb., 1
What Do Apples Cost? .....March, 1
4-Leaf Clover System of Pruning..March, 1
Date Growing .....April, 1
The Papaya in Florida .....May, 1
Soil Management in Orchards.....June, 1
The Carob Tree .....July, 1
Growing and Drying Prunes .....Aug., 1
New Spray for Apples .....Dec., 1
Modifying Biennial Bearing in Apples, Jan., 1
Planning a Nut Orchard .....Jan., 1
Is Your Sprayer Ready .....Feb., 1
Economy in Pruning .....Mar., 1

INDEX

Poultry

Cost Estimating ..... June, 1941
Dropping Boards or Pits ..... July, 1941
Better Pullets on Range ..... July, 1941
Analyze Your Costs ..... Aug., 1941
Forty Million Broilers ..... Aug., 1941
Out-of-Season Brooding ..... Sept., 1941
Coolers Boost Egg Income ..... Sept., 1941
Make Them Eat More Grain ..... Sept., 1941
New Slants on Feeding ..... Sept., 1941
Pullets Pay Big Rent for Crop Land . Sept., 1941
Marketing 1,400 Turkeys at Retail .. Oct., 1941
Methods and Rations for Fattening Poultry, Oct., 1941
Why They Die ..... Nov., 1941
Resistance and Immunity ..... Nov., 1941
The Nittany Turkey ..... Dec., 1941
Fowl Leukosis Battle ..... Dec., 1941
Digestion of Poultry ..... Dec., 1941
Calling All Farm Flocks ..... Jan., 1942
Management for High Egg Production, Jan., 1942
Does Heat for Layers Pay? ..... Feb., 1942
Nutritive Requirements of Poultry .. Feb., 1942
Barbecued Chicken ..... Mar., 1942
Poultry Manure Is Worth Money .. Mar., 1942
Saving Labor on the Poultry Farm . Mar., 1942
Breeding in Step with Feeding .... Mar., 1942
Selecting Breeders ..... April, 1942
R.O.P. and the Progeny Test ..... April, 1942
New Facts on Cannibalism ..... May, 1942
Finding Substitutes ..... May, 1942

Sheep

Soybeans for Lambs ..... Feb., 1941
Modern Shepherds ..... Feb., 1941
It Can Be Done ..... March, 1941
Breeding for Consumers ..... April, 1941
Cotton Coats for Sheep ..... June, 1941
Quality Spring Lambs ..... July, 1941
Ailments of Young Lambs ..... Aug., 1941
The Karakul Industry ..... Oct., 1941
Sheep and Wool in the West ..... Nov., 1941
Lamb Credit per Ewe Weight .... Dec., 1941
Box-Type Lamb Brooder ..... Mar., 1942
Sheep Production Programs ..... April, 1942
Self-feeding of Fattening Lambs .. May, 1942

Silage

Grass Silage Steps Ahead ..... Nov., 1940
Storing Grass Silage ..... Feb., 1941
Place of Grass Silage ..... March, 1941
Sweet Clover Silage ..... June, 1941
New Methods for Grass Silage .... Sept., 1941

Vegetables

What's New in Vegetable Gardening? May, 1941
And a Few Potatoes ..... June, 1941
Corn Earworms ..... June, 1941
Spray Groups ..... June, 1941
Lime Preferences of Plants ..... June, 1941
High Quality Celery ..... July, 1941
More Lime for Vegetables ..... Dec., 1941
Growing Winter Rhubarb ..... Feb., 1942
Tenants Share Garden ..... Feb., 1942
What's New in Vegetables for 1942 . Mar., 1942
How a Champion Grows Tomatoes . April, 1942
Fertilizing for Better Vegetables .. May, 1942
Should Potatoes Be Planted Thick or Thin?, May, 1942

The Farmers Digest

Presents Each Month Facts about Some Outstanding Agricultural Magazine

The Cattleman

Owned and published by the Texas and Southwestern Cattle Raisers Assn.; official publication of the Texas Hereford Assn. and the Texas Polled Hereford Assn.

This magazine was founded in June, 1914, as a means of communication between members of the largest and most influential cattle organization in the country; to further the interests of the range cattle industry generally; to serve as a merchandising medium for the commercial and purebred cattle operators of the foremost cattle producing state in the Union.

Essentially a monthly magazine of the range livestock producer, "The Cattleman" has subscribers in every state and in some 20 odd foreign countries. With limited subject matter — featuring cattle raising and finishing, but with sufficient articles and items on the production of sheep and horses to give it a good balance — "The Cattleman" has not encouraged large circulation, or distribution outside the sphere of influence of the parent organization. However, the full net paid circulation at this time averages well over 15,000 monthly.

It is the business paper of the Southwestern cattleman.

Front covers of "The Cattleman" are lithographed in color. They are framed by many of our subscribers. Each is a "subject" picture or sketch. The one used on the April, 1942, issue shows the mode of ranch travel 40 years ago and applies it to the tire situation of the present day. This is discussed fully in the first reading matter in the magazine.

Tad Moses has been editor of "The Cattleman" the past 15 years. O. R. Peterson is its field representative. Publication office is in the Coliseum Bldg., Fort Worth, Texas. Subscription price is $1.00 per year.

The above is printed for the information of our readers, and as a courtesy to the sources of our information.

The Johnson Press, Ambler, Pa.